THE POLAR TIMES

January 2007

Looking Back on IGY and Operation Deepfreeze I

President's Letter

As you read this, we are at the start of the International Polar Year (2007-2009). What a contrast to the International Geophysical Year (1957–58), as I describe later in this issue. Many young scientists and other polar workers will be inspired by IPY, as I and my young colleagues were 50 years ago by IGY. I believe IPY offers the American Polar Society an opportunity to rejuvenate itself, if we choose, by reaching out to these new workers and including them in our membership.

We are jointly sponsoring a symposium with Byrd Polar Research Center to be held at the center in Columbus, Ohio, April 25-27, 2007 on "U.S. Science and Policy: Celebrating IGY (1957-58) and Planning IPY (2007-2009)." This will provide us an opportunity to meet with our members and others involved in polar research and other Arctic and Antarctic activities. Significant issues face United States polar programs, most of them constrained by money. I raise several here, but obviously you can think of more.

There are only two heavy ice-breaking polar-class U.S. icebreakers, *Polar Sea* and *Polar Star* (the *Healy* has only light ice-breaking capability). *Polar Star* needs renovation and is not in operation now. Both ships are about 30 years old and at the end of their planned operational lives. A recent National Research Council (NRC) study states that even if these ships received required renovations, at the potential cost of hundreds of millions of dollars "you still have an old ship," as pointed out in an EOS article about the study. The NRC report recommends replacement, but the cost is estimated to be about $1 billion for two ships and would take 8-10 years. NSF cannot wait that long. Although the U.S. Coast Guard operates the polar icebreakers, NSF pays the bill. Two icebreakers are needed to resupply McMurdo, which is, in addition to science, essential as a base to resupply South Pole Station. Again, in addition to science, South Pole Station, which has just been rebuilt for about $150 million, has been determined to be in the U.S. national interest. NSF has been using a Russian ship to resupply McMurdo and this year will use a Swedish ship.

A December 2003 American Geophysical Union position statement on human impacts on climate states that "human activities are increasingly altering the Earth's climate." Natural influences alone do not explain the increase in global near-surface temperatures in the latter half of the 20th century. The statement notes that human impacts include atmospheric greenhouse gases, as well as air pollution, airborne particles, and land alteration.

Because global warming is impacting polar areas more than elsewhere, its effects on the Arctic and its indigenous people are and will continue to be profound. As commercial shipping through the diminished summer north polar ice pack becomes practical in the next decade or two, the need for polar icebreakers will increase there, as well as in Antarctica. The sea is encroaching on native villages throughout the Arctic, and decisions on their future will involve U.S. and other governmental actions. Petroleum development in the offshore exclusive economic zones of Arctic countries will impact the fragile marine ecosystem there.

The Greenland Ice Sheet and the Antarctic Peninsula-West Antarctic Ice Sheet are showing dramatic decreases in ice in the past five years, as revealed by satellite observations. Several Greenland outlet glaciers show tens of to one hundred meters surface elevation decrease in the past several years and dramatic speed increases. The decrease in ice mass as measured by the GRACE gravity satellite has even accelerated just since 2005 in southern Greenland. Ice shelves are collapsing along the Antarctic Peninsula, resulting in acceleration of formerly dammed outlet glaciers by a factor of ten. The GRACE satellite shows that ice mass has decreased significantly in West Antarctica in the past five years. A number of our members (and future members?) are actively carrying out research programs studying these effects of human-induced climate change.

If you have suggestions or comments on these issues, please contact me or the Board of Governors. What are practical measures the American Polar Society can undertake to increase membership and to rejuvenate itself by addressing these problems?

John Behrendt

APS President

Secretary's Letter

This coming year will be significant with regard to polar science and history because, as you are most probably aware, the fourth International Polar Year—IPY 2007-2008—will begin. The goal of this monumental task is to have a better understanding of how the polar regions impact global climate systems. The first IPY was conducted from 1881 to 1884, the second from 1932 to 1933, and the third—1957 to 1958—saw service from much of our membership. The third IPY also was host to studies outside of the polar realm, including near-earth space and sun physics, and is better known as the International Geophysical Year (IGY).

In addition to this event will be the American Polar Society 2007 Symposium to be held in Columbus, Ohio at the Byrd Polar Research Center at Ohio State University April 26th-27th, 2007. A flyer has been included with this issue that details the event. The theme will be IPYs past and present, and there is a great lineup of speakers and events. We hope as many of you as possible can join us to help celebrate our past and continued exploration of what I feel are the most fascinating regions of the planet.

Also, the APS is getting a face-lift with our web page. Over the years, Billy-Ace Baker has maintained a very nice site of his own volition, but it was decided by all of us to host a page with APS support. We owe a great amount of gratitude to Billy-Ace for keeping his site going over the years, and we hope he will continue to contribute to the links and postings, as much as his time allows.

Lastly there has been some discussion of how to bring new members on board, especially the younger crowd. I know for many of us, *The Polar Times* is why we joined as there is no better journal that keeps everyone informed of what is happening at the poles, regardless if they are scientist, contractor or tourist. My introduction to PT came when we were having a safety briefing at South Pole for the construction crew of the new station, and a pile of PTs was passed around. I am not sure how many besides myself ending up joining, but if any of you see that type of opportunity knocking, please notify us and we will see about getting a stack to you for promotional purposes.

See you at the Symposium. Best wishes,

Kevin Bjella

Secretary

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About Our Front Cover

One of the wide-tread D-8 Caterpiller tractors hauling a train of cargo sleds at Kainan Bay in 1956. Also a replica of the original IGY logo. (Official US Navy Photo) ❑

American Polar Society

The American Polar Society was founded Nov. 29, 1934, to band together all persons interested in polar exploration. Membership dues are $15 a year ($17, foreign) and entitle members to receive ***The Polar Times*** twice a year. The American Polar Society is classified as a tax exempt organization under Sec 501(C)3 of the IRS Code. For more information about the American Polar Society, contact Kevin L. Bjella, ***APS Secretary***, at 1.802.295.6881 or send email to kevin.bjella@erdc.usace.army.mil.

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IGY AND OPERATION DEEPFREEZE I

In this issue of The Polar Times, we celebrate the 50th anniversary of the launch of the International Geophysical Year and Operation Deepfreeze I.

The Austral Summers of 1955, 1956 and 1957 were the seminal years, and we wish to recognize the people and events of these years through the eyes of those who were there and are still with us today, many of whom are active members of the American Polar Society. There are shelves of books, official publications, media reports and other sources that recount in detail the background, planning, execution and achievements of the IGY and the establishment of our permanent presence on the Antarctic continent. There is no need to go over this vast territory again in the limited pages we have available. Rather, we have chosen to call upon veterans of those beginning years to share with us their personal experience[s], a lasting memory of their first time on the ice or some recollection of an event[s] that defined or influenced their continued involvement with this immense, most formidable, yet ever beguiling continent. ❑

John Behrendt, President of The American Polar Society, leads off. . .

A Half-Century Perspective on the International Geophysical Year (IGY)

In 1956 I sailed for Antarctica to spend 18 months as a graduate student participating in geophysical-glaciological investigations of the Filchner Ice Shelf, as part of the 18-month International Geophysical Year (IGY). This led to a career in geophysics, which has taken me to all of the continents and oceans. As we approach IPY 2007, the changes in technology and our understanding of the earth over the past half-century are breathtaking to contemplate, retrospectively. Although 70 countries participated in IGY, the disciplines represented were restricted to geophysics in the broad sense in the 1950s.

The year 1956 was the beginning of the "scientific era," ushering in the International Geophysical Year of 1957-58. Two books (see Bibliography at end of article) are accounts of my personal experiences in Antarctica—from November 1956 to March 1958 (the IGY period) and October 1960 to March 1962—as a participant in this ambitious undertaking. The Antarctic Treaty was negotiated and signed in 1959, largely as the result of the peaceful cooperation and scientific success of the IGY and the continuation of the research programs on the continent in the following years.

The Antarctic Treaty entered into force after all twelve signatories had ratified it in 1961. No territorial claims are recognized, all preexisting claims are essentially frozen, and no new claims can be made as long as the Treaty is in force (indefinitely).

The National Science Foundation (NSF) provided much of the funding for the scientific part of the U.S. Antarctic Program during the IGY, along with other federal agencies, but their staff was not directly active in Antarctica. The entire scientific program then was managed by the U.S. National Committee for the IGY at the National Academy of Sciences and operated through the Arctic Institute of North America, which employed many of us. The big budget was the Navy's and was funded through the Department of Defense. As planned, the U.S. IGY expedition lasted from 1955 through 1959. By this time, the NSF had taken over the scientific program, designated the U.S. Antarctic Research Program (USARP), which had a budget of about $6 million. The Navy budget for Antarctica was about $20 million/year.

When we young scientists first went to Antarctica to participate in the mission-oriented directed research of the IGY, the world was quite different from the undirected proposal-driven U.S. Antarctic Program (USAP) of the 1980s–2006 period. The Cold War was at its height, and the Navy and participating researchers accepted risks that would not be tolerated today. The Antarctic air squadron VX6 had an accident rate eight times that of U.S. Naval aviation in other parts of the world at that time. Because of these risks and U.S. strategic interests prior to the entry into force in 1961 of the Antarctic Treaty, with its disarmament and territorial claims articles, we graduate students and technicians (all male) of draft age were deferred from military service. We were also given a 25 percent hazardous duty pay differential for the period we were in Antarctica.

Fifty years later the U.S. Antarctic Program has altered dramatically, as has my perspective as a researcher "on the Ice" in each of six decades. Since the 1950s much has changed in the way Antarctic science and U.S. Antarctic expeditions operate. Most notable are the presence of women and, in descending order, greater safety, availability of reliable maps, mail (more than once a year), transportation (in the IGY we had to spend 15 months in Antarctica to get a three-month field season), fresh food during the summer and, of course, technological advances, particularly in electronics, communication, computers, satellites, navigation, etc. Fifty years ago, large areas of Antarctica, which we studied in the period described here, were totally unmapped and had not been seen from the air.

Ellsworth Station

"You can only go to Antarctica for the first time once!" Thus I was told, so I recorded events conscientiously in a daily journal I kept from our departure in November 1956 until our return in January 1958 to Buenos

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Paul Dalrymple remembers...

Little America, 1957

Once upon a time, Antarctica was a tight little family. When I arrived at Little America V in January 1957, coming off the *USS Curtiss* by helicopter, we were flown directly to the station, about two miles from the Barrier at Kainan Bay. The camp had been occupied the previous year, so there was a full complement of people. Shortly after arriving, I heard that Amory H. "Bud" Waite was in the infirmary, and I could not believe it. The first pure Antarctic scientist who I ever heard lecture was the same individual, lecturing on the 2nd Byrd Antarctic Research Expedition, 1933-35 in Thomaston, Maine, back in 1936. I dropped in to pay my respects and found that he had recently fallen off a sledge, and a weasel had pulled the sledge over Bud's body, cracking several of his ribs. It seems Bud was running a satellite station outside of the main camp, one appropriately named Camp Cold Bottom, where Bud was continuing his exploratory studies on radio wave propagation .through snow. Bud and I maintained our friendship for several decades, but we never forget our first reunion on the ice. ❑

IGY (CONTINUED FROM PAGE 3

Aires, Argentina, which was the basis for my IGY book (Behrendt, 1998). I am a geophysicist and, in 1956, I had just finished my master's degree and had obtained a position as assistant seismologist to work on the IGY glaciological program. I was a twenty-four-year-old graduate student when I sailed from the U.S. Navy base at Davisville, Rhode Island. I had romanticized Antarctic exploration since a boy, and although the pursuit of science and a Ph.D. degree was my ostensible purpose, the romance and adventure part was what really drew me south to the seventh continent. What I didn't know then was that adventures in Antarctica only happen when someone makes a mistake. My IGY trip became a turning point in my life and led to twelve additional Antarctic trips over the past fifty years, most recently in 2003.

I traveled to Antarctica in 1956-57 (Deep Freeze II) on the *Wyandot*, a U.S. Navy attack cargo ship escorted into the Weddell Sea by the Navy Wind-class icebreaker *Staten Island*, both ships of World War II vintage. In trying to reach the site where we intended to build Ellsworth Station, we encountered very heavy ice up to 8 m thick, with many pressure ridges. The two ships, both seriously damaged, were beset several times for a total of 21 days. We finally landed on 26 January 1957 on the edge of the unexplored Filchner Ice Shelf and unloaded cargo and supplies for our station and for the geophysical traverse. Instead of the planned 40 days for base construction, the ships departed for home on 11 February, leaving the station only 70 to 90 percent completed (estimates varied).

For the next several weeks the nine scientists and thirty Navy men worked exclusively on base construction as the winter approached. During the fall and throughout the winter, we geophysicists and glaciologists carried out investigations in the area surrounding Ellsworth Station. The geophysical work included seismic reflection and refraction surveys and measurements of the sea tide of the southern Weddell Sea using a gravimeter indoors at the station to measure the rise and fall of the floating Filchner Ice Shelf. The glaciologists dug a 31 m deep snow pit where temperature, annual snow accumulation measurements, density and other observations were made.

Filchner Ice Shelf Traverse

In this overview I will concentrate on one of the U.S. IGY over-snow traverses, based on my personal experience. All of the U.S. traverses used the same equipment and techniques; however, the experience of each was unique. Our general objective (along with that of other countries) was the definition of the Antarctic Ice Sheet (surface elevation, configuration and thickness), snow accumulation and other glaciological parameters.

At the time of the IGY, all of us on the over-snow traverse program had to be explorers as well as geophysicists and glaciologists. Most of Antarctica had not been seen from the air, and even the coastline was not completely mapped. Finally, after three months at sea, a troubled and difficult winter at Ellsworth and an intense few weeks of preparation, five of us (Edward Thiel, chief seismologist; John Behrendt, assistant seismologist; Hugo Neuburg, chief glaciologist; Paul Walker, assistant glaciologist; and Nolan Aughenbaugh, geologist) left on an over-snow traverse across the essentially unexplored area south of the Weddell Sea coast. We were soon to find out whether the establishment of Ellsworth Station three kilometers south of the sloping ice front of the Filchner Ice Shelf had left us a reasonable route into the interior of Antarctica, or left us isolated us north of an ~80 km long rift through the ice shelf named the Grand Chasm.

Our primary objective was the measurement of the snow-surface configuration, the ice thickness and the depth to underlying bedrock, using seismic reflection and gravity methods. We would measure snow accumulation, average annual temperature and other glaciological characteristics of the ice sheet, make observations of Earth's magnetic and gravity fields, study the geology of any mountains we encountered and make other scientific observations as were presented.

On 28 October 1957, our five-man party left Ellsworth with two Sno-Cats (the other U.S. IGY traverses had three or four), each pulling a 2.5-ton sled filled with fuel, food, explosives and all of our scientific and other equipment.

Traverse at intermediate station. Behrendt reading magnetometer at left. Walker and Aughenbaugh making snow hardness measurement left background. Thiel on track of Sno-Cat after making a gravity measurement. Crevasse detector visible on lead vehicle.

For the next 81 days we made a geophysical-glaciological reconnaissance of the Filchner-Ronne Ice Shelf area and made the first geologic observations of the Dufek Massif.

I put in my first magnetic station near Ellsworth, and we then headed southeast, taking gravity, magnetic and altitude observations every 8 km. We used the gravity and magnetic measurements to study the variations in density and magnetic properties of rock beneath the ice and therefore to make inferences about the ice-covered geologic features. We also used the gravity data to determine the depth to bedrock between the seismic reflection stations. This is possible because the rock is much more dense than the ice or water. The lower the gravity, the deeper the bedrock. We had a radio in each vehicle, and the drivers were in constant contact using headphones to hear over the roar of the engines and the clatter of the vehicle tracks.

The logistics of our traverse were dictated by the fact that state-of-the-art electronics at the time depended on the vacuum tube, rather than the solid-state electronic microcircuits available today. The hundreds of tubes in our seismic system required large amounts of battery power produced by two 250-amp-hour truck batteries weighing 80 kg each. The only recording system was the heavy oscillograph "camera" with its tanks of photographic solutions. Altogether, the seismic Sno-Cat carried a total load of about 500 kg of electronic equipment, gravimeter, magnetometer and seismic batteries. Counting the weight of two people in the vehicle, we carried about the maximum allowable load. Each Sno-Cat used about 3 liters of fuel (gasoline) per km or about 200 kg for a 50-km day for two vehicles. This fuel—a little more than one barrel per day—would determine how frequently we needed resupply by the two available single-engine Otter aircraft. These planes could only carry a few barrels of gas in one trip depending on our range out of Ellsworth. Their maximum allowed range was only 460 km from the base, although they exceeded this limit on several occasions.

Unlike many Antarctic field parties today, we could not have used snowmobiles (which had not yet been developed) because of our heavy loads. There were two other significant reasons for using the high fuel-consuming Sno-Cats on the traverses. The first was safety. A Sno-Cat was the lightest snow-pressure vehicle available at that time, which proved very important in crossing crevasses. Also, because we were a working scientific field party, not an adventure expedition, any convenience in general camping greatly speeded up our progress. We slept in the Sno-Cats, so on a number of occasions when we had been up for 24 hours or more, it took less than a minute to crawl into a sleeping bag after stopping for the "night" or after downing a quick meal. Putting up and taking down Scott tents, commonly used by geologists in semi-stationary Antarctic field camps today, would have been time consuming and inconvenient for a field party moving every day. This was particularly true when stopping in a storm or when surrounded by invisible bridged crevasses. Several years later, when I led a traverse with three vehicles, we traveled with one six kilometers ahead of the other two, for barometric altimeter corrections.

Navigation over the course of a day's travel was by dead reckoning, using the gyro compass mounted in the lead Sno-Cat. A few years later the U.S. traverses changed to magnetic compasses mounted in the Sno-Cats, which were an improvement because of the fragility of the gyrocompasses. Despite the conventional wisdom, magnetic compasses work well in Antarctica, except possibly very close to the magnetic pole about 2000 km from our traverse area. About every 40-60 km, Neuburg, our navigator, measured our position from the sun using a theodolite on a tripod. He determined the time with a chronometer that was checked with a time signal from the U.S. National Bureau of Standards radio station WWV, which we received well. He then calculated our position using a slide rule (pocket calculators did not exist) to better than 200 m accuracy using a nautical almanac. It was easy to steer a Sno-Cat in a straight line despite the weaving, which averaged out. Therefore, we could correct the dead reckoning positions of the 8 km spaced gravity and magnetic stations along our route, every day that we stopped for station work, using the accurate position obtained from the sun shots.

Steering the Sno-Cats on a planned course, with compasses and odometers, was amazingly accurate. In 1960-61, I navigated by dead reckoning to poles left by an earlier traverse and later to a field camp in zero visibility caused by blowing snow. Unlike ships and airplanes, Sno-Cats did not drift sideways. Traveling at only 5 to 8 km per hour, they did not get very far off course in 8-12 hours.

We had no geographic information, so we used a blank gridded chart as does a ship plotting its position at sea. In this manner we mapped the course of our traverse and any features of the snow surface that we could observe. As our horizon was quite limited, the process somewhat resembled blind men attempting to describe an elephant.

Radio communication with Ellsworth Station was very difficult throughout the traverse, not only because our 7.5-watt transceivers were not very powerful, but also partly because we were on an ice shelf floating on seawater—a good electrical conductor. There were periods of time when we had no radio contact for several weeks and several hundred kilometers of travel. Today lack of radio contact for even a day is cause of concern and probable launch of a search-and-rescue flight.

All our cooking was done outdoors on a large "white" gasoline stove. In contrast with the 200 kg of fuel we burned in the vehicles, the weight of any food we carried was negligible. Because of this we dined very well on fresh-frozen food including a 3 kg beef tenderloin every other day. Because there were many delays caused by crevasses and vehicle breakdowns, we gradually found ourselves on a 36-hour schedule: 12 hours science, 12 hours travel and 12 hours sleep (interrupted by huge meals).

Seismic and Glaciology Observations

We spaced seismic-glaciology stations at about one day of travel distance apart (~50–

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Dick Cameron remembers...

Wilkes Station, 1957

Wilkes Station was located on some rocky islets that melded with the ice sheet allowing access to the interior. The station was just about at the Antarctic Circle and 110 degrees longitude. There were 27 personnel, 17 Navy and 10 civilians. The leaders were Carl Eklund and Lieutenant Burnett., It was a well run station and we always signed off our ham radio with K4USK Wilkes Station, the best U.S station in Antarctica. Pole Station felt that we were downgrading their station so Paul Siple sent Eklund a formal message of protest.

When Sputnik went up in October of 1957 it was an exciting time and Ralph Glasgal, our aurora man, was able to make a recording of its signal. Several days after it was up the Navy aerographers tied a light to a balloon and sent it aloft running in to tell Ralph that they sighted Sputnik in the night sky. Ralph ran out, saw it, but yelled "Great, but its going the wrong way." ❑

IGY (CONTINUED FROM PAGE 5)

60 km). The geophysical measurements at these consisted of a seismic reflection sounding to measure the depth to bedrock and seismic measurement of the increase in sound velocity (and thus snow density) with increasing depth. We would lay out our 330 m seismic cables in an "L" shape, which we unrolled from reels carried on our chests. We would then hand-drill a 2m–9m-deep shot hole at the apex of the "L." We fired a small explosive charge of 0.5–2 kg of ammonium nitrate detonated with an electric blasting cap and a 0.5 kg high-explosive primer charge. The sound waves penetrated to the ice-water contact (in the case of the floating ice shelf) and to the water-rock (or ice-rock) contact and reflected back to the surface where they were picked up by the geophones. Each of the 24 geophones was attached to one of the channels in the cables. The seismic signals were amplified and recorded on photographic paper, which spewed into my hand at 1 m/s. On a few occasions the wet paper record froze in my hands as I wrote the data on the back after developing the record. We could identify the reflection by noting the wave form on each channel at slightly longer times, the farther the geophones were from the shot point at the center of the "spread" at the Sno-Cat. Because we knew the velocity of the sound waves in the snow, ice and seawater beneath the ice shelf, we could calculate the depths to the various reflectors. The L-shaped array allowed determination of the dip of the underlying bed of the ice.

There was some hazard associated with laying out the cables when we were working in crevassed areas. In these cases we skied, which offered some protection. We also used skis when we were not in areas of known crevasses, if the snow was soft.

Neuburg and Walker used a two- or three-meter pit in the snow to measure snow accumulation and other glaciological parameters such as density and temperature. In addition to the snow pit, they would hand-drill a hole 9 m deep and place an electric-resistance temperature probe on a cable in the bottom. This would come to equilibrium "overnight," and the average annual temperature of the surrounding area was obtained. This is possible because the winter-temperature cold waves and the alternate summer-temperature warm waves damp out essentially to a constant temperature at that depth after several years. The mean annual temperature was measured this way to an accuracy of about 0.1°C at intervals of 40–50 km on thousands of kilometers of over-snow traverses crossing Antarctica. If repeat measurements were made at some of these locations today, any global warming greater than about a half a degree during the intervening 40–50 years could be detected.

Crevasses

The lead vehicle had a crevasse detector mounted in it projecting about 6m ahead. About 10km out of Ellsworth Station, the sled behind the lead vehicle broke through a snow bridge into a crevasse, and sank about a meter, but was pulled out by the Sno-Cat without stopping. This minor incident set the pace for the entire 2100-km-long over-snow traverse. Crevasses are tension or shear fractures in the ice shelf, having steep vertical sides and extending from 20 m to more than 100 m deep. This small crevasse was probably about 20 m deep, pinching out at the bottom, but we generally could not see the bottom when looking down. The extreme case on our traverse was the Grand Chasm, which extended entirely through the 700-m-thick ice shelf there. With essential guidance by radio from a single-engine Otter aircraft we negotiated our way safely through the complex crevasse pattern at the east end of the Grand Chasm.

Sno-Cats approaching Dufek Massif.

Although we commonly saw open crevasses on the traverse, the ones that gave us the most trouble were bridged with snow and could not usually be seen from the surface as we drove along. Sometimes we could safely drive across snow bridges, but other times we broke through. The Sno-Cats were nearly as safe as a man on skis because of their relatively low weight and four wide-tracked pontoons. It is much easier to see bridged crevasses from the air, but this method is severely limited, even when a plane is flying directly over the terrain. The crevasse detector was never of much use to us. There were many false indications or indications of crevasses with bridges too thick to concern us. This detector was probably meant as a surveying instrument; as such, during the unloading of the ship it might have been useful in locating dangerous spots on the route to the camp. However, at the five to eight kilometers per hour we were attempting, it was not effective. When we encountered serious problems, we realized from the start that we had to leave the Sno-Cats and search out each crevasse with long T-handled tubular aluminum probes. We traveled in crevassed terrain most of the 81 days of the traverse; several times vehicles and sleds broke through, and one man fell in about 10 m, but was rescued safely.

After many crevasse problems, we climbed and crossed Berkner Island and arrived at the Dufek Massif on 9 December 1957. We spent six days making geologic observations and exploring the range before heading northwest across what is now named the Ronne Ice Shelf. Our farthest point just northwest of Korff Island was reached on 1 January 1958. Because we were beyond the range of the single engine Otter aircraft supporting our party, we retraced our route several hundred kilometers. During one 24-hour period we drove the Sno-Cats 224 km, which probably was a record for a tracked vehicle in Antarctica for several decades. We were evacuated by air to Ellsworth on 17 January, leaving the vehicles and equipment for the men who would replace us.

IGY Achievements

A very few of the significant accomplishments of the IGY include the discovery of

the Van Allen belts (the symbol of the IGY was a satellite circling the earth); the observation (at Mauna Loa) and recognition of the rapid global increase in carbon dioxide; the first major models of Arctic sea ice formation, decay and drift; and the mapping of the mid-ocean ridge system.

In Antarctica, determinations to a first approximation of the mass of the ice sheet, including the order of magnitude thicker ice than previously known or expected (over 4 km), was a highlight. A baseline of mean annual temperatures measured (to about 0.1°C accuracy) at about 40 km intervals along thousands of kilometers of over-snow traverse routes was defined. Three World Data Centers were established; scientific results and data were deposited and made freely available to all. The peaceful international cooperation in Antarctica led directly to the signing of the Antarctic Treaty in 1959, with the first disarmament and freedom of inspection and scientific investigations clauses in history covering a large area of the earth.

I anticipate even greater international scientific cooperation from the IPY 2007. A new generation of polar scientists was developed as a result of IGY; a few of us are still active in Antarctic research. A similar result will provide continuity for the next 50 years. ❑

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Dr. James A. Van Allen

Any discussions of polar or space science has to acknowledge and salute this giant of American and international science, who left us last summer.—Ed.

James Van Allen (Sept. 7, 1914–Aug. 9, 2006) was an acknowledged leader in world scientific circles for over 60 years—one would call him a promoter of international scientific cooperation. He had the unique ability to visualize scientific projects that were world-wide in scope and then convince scientific groups and governments that the research was in their best interest to promote.

Interestingly, his career began to take off in the planning stages of the second Byrd Antarctic Expedition during the early 1930s. As an undergraduate, Van Allen studied under Dr. Thomas Poulter and managed his geophysical research while Poulter was serving in Antarctica as Admiral Byrd's chief scientist and second-in-command. Upon their return from Antarctica in 1935, Poulter and Byrd made a special trip to Iowa Wesleyan University to attend Van Allen's graduation. Byrd, a national hero, was invited at the last minute to give the commencement address and to pass out diplomas. Afterward, the three spent several weeks in the field reviewing two years of geophysical research carried out perfectly for Poulter by the young Van Allen. Dr. Van Allen considered both Admiral Byrd and Dr. Poulter his mentors and this experience to be the genesis of his scientific career.

Van Allen received his Ph.D. in nuclear physics in 1939 from the University of Iowa and went to work at the Carnegie Institution in Washington D.C. in the Department of Terrestrial Magnetism. In 1941, with World War II under way in Europe and threatening the U.S., he converted to what he called "war work"—namely, helping to develop a device for naval anti-aircraft guns, called the radio proximity fuse. He spent WW II rearming the fleet with these new devices which proved to be an order of magnitude better at shooting down enemy aircraft than what was used previously.

Leaving the Navy after WW II, he went to the Applied Physics Laboratory at John Hopkins University, where he was in charge of high-altitude research using captured German V-2 rockets to carry out sub-orbital cosmic ray, atmospheric ozone and high-altitude photography in space. Later, he oversaw the development of the Aerobee rocket program which he used to conduct cosmic ray measurements and study upper-atmosphere magnetic fields.

In 1951, Van Allen hosted a meeting of eminent polar scientists at his home in Maryland. The outcome of the meeting was an agreement to organize the Third Polar Year during 1957-58. This was later re-named the International Geophysical Year (IGY)—a world-wide effort that resulted in most modern national polar research programs in the world today; accordingly, Van Allen has been acknowledged worldwide as the "father of the IGY." During the IGY, he completed significant space-oriented geophysical research from the Arctic to the Antarctic using balloons to carry his rockets (a combination called "rockoons") to 60,000 feet before launching them—thus avoiding the drag of the atmosphere.

Planning for the IGY also included a working group to plan experiments to be placed aboard orbital satellites—a concept that had no working model because there had been no satellites launched before. Van Allen was chairman of the Satellite Working Group II and thus was responsible for soliciting and selecting the experiments which were to be conducted on the satellite itself. During this period he coordinated the development of satellite scientific equipment to measure cosmic rays and other space phenomena. He also coordinated work with the Jet Propulsion Lab at Cal Tech and his team at the University of Iowa to build a transmitter/receiver for Explorer I, the first successful American satellite. Data from this experiment resulted in discovery of what are now known as the Van Allen Radiation Belts.

These IGY experiments were just the beginning of Van Allen's space work. His whole life changed with IGY, since his career from then on revolved around space research. He launched more scientific payloads into space than any other man. In his own words, "I have been looking down at the earth from satellites ever since." A sampling of the work in space that he performed includes co-discovery of the radiation belts around Jupiter and Saturn, first mission to Venus by Mariner IV, second mission to Venus by Mariner V and scientific packages on Galileo spacecraft that orbited Jupiter.

More importantly, Van Allen mentored a host of young scientists around the world who today continue to conduct exploratory missions into outer space. ❑

Contributed by Brian Shoemaker, who is the historian of the American Polar Society. He interviewed Dr. Van Allen on 18 November 1997 for what eventually became the Polar Oral History Program, a joint effort of the APS and Ohio State University's Byrd Polar Research Center (http://library.osu.edu/sites/archives/polar/oralhist/oralmain.php) ❑

Operation Deepfreeze I

by Cliff Bekkedahl, Managing Editor, The Polar Times

The officers and men of *USS Arneb* (AKA–56) learned of Operation Deepfreeze and something called the International Geophysical Year (IGY) in late spring 1955. A Navy message addressed to *USS Arneb* as well as many other fleet commands informed us that *USS Arneb* was Antarctica-bound and would be the Flagship for Commander Task Force 43, Rear Admiral George Dufek, USN. The admiral and his staff would embark on *Arneb* and direct the establishment of the U.S. facilities of Little America V and McMurdo Sound in Antarctica.

That *Arneb* would be chosen for this duty assignment was no surprise. We all knew that the ship had been modified in 1948 for cold weather operations; but the timing of this assignment did catch us by surprise. The outbreak of the Korean War had shelved plans for IGY scheduled to begin in the early 1950s, and *Arneb* had spent the years from 1948 to 1955 as a unit of the Atlantic Amphibious Forces. Those of us aboard thought our life in the "Gator Navy" would never end.

Our officer complement in early 1955 was 32, and our enlisted numbers averaged about 320 men. A large portion of both the enlisted and officer complement was dedicated to the landing craft and cargo handling requirements of an amphibious cargo ship. The orders to become flagship for CTF-43 also specified a reduction by half of *Arneb*'s total complement to make room for staff, Seabees, scientists and others who would be embarked for Operation Deepfreeze. The Navy asked for volunteers from ship's company to remain aboard *Arneb*, and the results were predictable. Almost all the married officers and men opted for reassignment and all the single officers and men vied for an opportunity to stay aboard for this once-in-a-lifetime cruise. As frosting on the cake, the volunteers later learned that *Arneb* would return home after Deepfreeze by way of Australia, the Indian Ocean, Suez Canal and the Mediterranean—in effect, this would be an around-the-world cruise.

Almost all the bachelors and a few married made the cut, and this enthusiastic crew began the formidable task of learning what it could of polar navigation, cold weather operations, ice and icebergs and as much about the continent of Antarctica as possible. We read all the books about the renowned explorers: Amundsen, Scott, Shackleton, Byrd and the most recent information available to us from the 1948 voyage of Capt. Finne Ronne and Operation Highjump, in which a sizable Navy task force cruised the waters, overflew the land mass and explored the coast of Antarctica. This was all inspirational and exciting, long on motivation but short on details about what to do when you meet the ice or sail the basically uncharted waters of an entire continent. But hey, we had spent a few years in the Amphibious Navy and learned to scramble when confronting the unexpected.

Not only did the wardroom of officers and the enlisted of *Arneb* lack cold weather operations experience, but the ship was scheduled for a change of commanding officer in the early summer of 1955. So, from top to bottom, we were greenhorns. Someone up there in the Navy hierarchy must have recognized this as a potential problem because the ship was ordered to sail north in July to transport and offload cargo (building material, fuel, etc) in support of construction of an Early Warning Radar site north of the Arctic Circle on Baffin Island. This cargo would be very similar to that which we would carry and off-load in Antarctica.

The icebreaker Atka *found such a place at Kainan Bay and, on inspection, Admiral Dufek said, "This is it."*

Rounding Newfoundland to the east and a day or so north, we encountered our first ever iceberg and, a few days later, drifting pack ice. Thin ice to be sure, but the real stuff and, after several weeks of operation in Baffin Bay and Hudson Bay, we became seasoned experts—or at least that's the way we felt. Truth is, we did learn a great deal, and the experience gave us confidence to face the much more challenging Antarctic environment.

Arneb's initial and major Antarctic assignment was to locate and reestablish Little America V. To this end we loaded all materials, equipment and Seabee manpower essential to building and stocking a facility that would support a wintering over party of about seventy military and civilian personnel.

After several days taking on this cargo in Davisville, R.I., the ship returned to Norfolk, Va., for last minute repairs and preparations, some overdue R&R and a 14 November departure and farewell ceremony that would mark the beginning of Operation Deepfreeze. Admiral Dufek and staff would join us later in Panama for the Pacific crossing to New Zealand in late November.

The transit was uneventful except for the boarding of King Neptune and his court to initiate all the Pollywogs incident to *Arneb* crossing the Equator. King Neptune had a remarkable resemblance to Admiral Dufek, who we all found to be a true gentleman and an inspiring leader throughout the entire time we served under his command.

Our welcome and stay in Port Lyttleton, N.Z., and post-Antarctic port visits in New Zealand and Australia were overwhelming—indeed, unbelievable even to this day! The personal relations and friendships that evolved between *Arneb* personnel and the New Zealanders in our first visit and in subsequent years rightfully deserve to be the subject of a book all its own. Veterans of these early days will smile and nod wisely as they read these words.

All the foregoing is, of course, prelude to the two transcending events that captured the heart and left indelible images in the minds eye, lifelong and undiminished. The first is the sighting of the two-hundred-mile-wide Antarctic ice belt that yearly breaks away from the continent and drifts north to oblivion; once this is traversed, there is then open blue water and the subsequent, stunning confrontation with the towering Ross Ice Shelf. Yes, there are the Grand Canyon, fjords and mountains in the Rockies, Norway and the Alps, as well as Everest and many other magnificent mountain ranges and desert landscapes that contend for majesty; but having seen many, none match the ice of Antarctica for stark, breathtaking and unforgettable beauty. Surely none of the readers here will argue this point.

A series of unlikely, un-Navy and complex events in the command structure of *Arneb* resulted in the junior officers—those qualified as deck watch-standers—having unprecedented opportunities to conn the ship in Antarctic waters. By this is meant they maneuvered the ship, steering it through the pack ice, maintaining distance from lead icebreakers, making the judgments and giving the orders to avert ice damage to hull, propulsion and steering gear. These would normally have been the responsibility of more senior officers—indeed, the commanding officer himself. For reasons not impor-

tant here this was not the way it happened, and the junior officers did the job and did it well. With some two hundred miles of pack ice and a slow rate of advance through heavy ice, we all had ample opportunity to conn the ship and also good naturedly observe and critique our shipmates' ship-handling skills. This situation continued for the duration of *Arneb*'s time in and eventually the exiting from Antarctic waters.

The helicopter off the icebreaker *Glacier* located Admiral Byrd's former Little America station, but it was determined that the site was unacceptable for re-establishing a facility (Little America V). A further search along the Ross Ice Shelf was made to find a suitable location that would allow *Arneb* and the Maritime Service *Greenville Victory* to tie up alongside the ice for off-loading and also provide an appropriate gradient or slope so that cargo could be hauled to the top reaches of the ice shelf where a safe site for building a facility could be located.

The icebreaker *Atka* found such a place at Kainan Bay and, on inspection, Admiral Dufek said, "This is it." *Glacier* carved a straight edge along the seaward ice, *Arneb* sailors installed "dead men" in the ice as mooring points for *Arneb* and *Greenville Victory,* and unloading began. It was 30 December 1955.

Penguins entertained us, seals ignore us, skua gulls wheeled around above and killer whales, from time to time, had a disturbing habit of raising their heads out of the water to place them on to the ice and measure us with their cold eyes, as if wondering if we tasted like chicken.

Unloading and hauling cargo up the ice road went on around the clock. Actually, the clock meant little in the constant daylight except to signal a meal hour and, even then, times for eating were irrelevant inasmuch as the mess deck and wardroom galley were open 24 hours for soup and sandwiches, pie and barrels of coffee. Everyone packed on extra calories on the mess deck and burned them on the ice.

Supervision for efficiency of operations and safety was essential, but everyone quickly mastered their assignments, and few orders were issued or musters taken. There were no slackers, no sea lawyers, no need for inspections or drills. To a man, *Arneb* sailors relished their work in this awesome environment and pitched in to every task with their full energies and enthusiasm. Frost bite was a continuing threat but, overall, the weather and temperature did not hinder operations. As it happened, a major concern was that the disorientation, engendered by 24 hours of sunlight, would lead men to work too long and fail to get enough rest.

In the late days of January, the cargo in *Arneb*'s and *Greenville Victory*'s holds dwindled, and more and more *Arneb* sailors volunteered to go up the hill to help the Seabees with their building and cargo storage tasks. Toward the end of our stay, free time came available to take recreation on the ice, try out the awkward X-country skis and play soft ball on the ice. A few daring and foolish junior officers explored some crevasses in the ice shelf—an incredibly beautiful experience but foolish nonetheless.

Little America V was self-sufficient by the end of January, and *Arneb*'s time in Kainan Bay came to an end. *Greenville Victory* had cargo destined for McMurdo Sound and, together, we sailed west looking forward to our first glimpse of Mount Erebus, the legendary backdrop to McMurdo Sound. *Arneb*'s stay at McMurdo was brief, and icebreakers reported that the ice belt had dispersed, which allowed *Arneb* to take departure on a northern heading to New Zealand.

By all reasonable measure, Operation Deepfreeze I was a successful operation in a hostile environment. Weather played a role in the loss of two aircraft, and two men lost their lives in the deadly traps laid by ice crevasses. No lives were lost or serious injuries were sustained in the aircraft incidents, which was certainly a stroke of good fortune.

The naval aviation component of operation Deepfreeze performed brilliantly, starting with the long fly-over in early December from New Zealand to the make-shift landing strips at McMurdo and then to the countless on-ice missions flown in support of scientific and exploratory projects. Pilots and air crews, ground crews and maintenance men, along with ship-based and shore-based radar and communications personnel, worked extraordinarily long hours, ofttimes under extreme weather and atmospheric conditions, to achieve their missions. The Navy's elite Squadron VX-6 enjoys a stellar reputation in the annals of military aviation, and the components of the squadron that served in Antarctica for decades following Operation Deepfreeze I earned and own a large portion of that reputation.

Northward bound began a new chapter in *Arneb*'s long and illustrious naval service. The ship returned to Antarctica in support of IGY six more times. On her second voyage in 1957, *Arneb* was badly battered by ice and yet managed to complete her assignments before limping to Sydney Australia for dry dock and repairs.

This past September, five of the *Arneb* junior officers held a 50th reunion get-together in eastern Long Island [see photo below]. Only two of the J.O.s had seen each other, and then only briefly, in the years since *Arneb* returned from Deepfreeze I, but the memories and friendships were instantly rekindled, and once more the old, somewhat faded 35mm slides found appreciative viewers. ❑

Five former junior officers of* USS ARNEB *shown here on 7 September 2006 at a fifty-year anniversary celebration of ship's participation as Flagship for CTF-43 during Operation Deepfreeze One [1955–1956]. Left to right: Dr. John Eagan, M.D., Spencer Ervin, Donald J. Renz, Cliff Bekkedahl and Frank Meredith.

Fresh-Caught Ensign Selected Dog Sled Driver For Operation Deepfreeze

Now that's a human interest headline! We don't know if it ever made the papers but it's still a good story about our own Dave Baker, treasurer of the APS.

Dave's interest in Antarctica dates from the late 1930s when he heard his father speak of Capt. Scott's extraordinary and tragic return from the South Pole in 1912. By the time he was 8 years old, he had read Scott's, Shackleton's, Amundsen's and Byrd's chronicles and dreamed of one day traveling to Antarctica.

During high school, Dave was mentored by Bob Bates, one of America's great mountaineers. Rock climbing in Huntington Ravine on Mount Washington, a winter's climb of Mount Katahdin in March of 1949, climbs in the eastern Alaska Range became milestones in Dave's life. But not until 1955, as an officer candidate at the Navy's OCS in Newport, R.I., did Dave see a chance to follow in the footsteps of his childhood heroes. In a message to all hands, the Navy sought volunteers to winter over at Little America, McMurdo Sound and other bases to be established in 1955-56 in support of the International Geophysical Year (IGY).

Dave did some research and found his best hope of being selected for an assignment to Antarctica was to interview with Capt. Dick Black who was then Base Operations Officer for U.S. Antarctic Support Forces [Task Force 43]. His interview request was granted and, within days of his commissioning as an ensign, Dave found himself seated next to Capt. Black's desk in the Old Post Office Building in Washington, D.C.

Capt. Black had served with Admiral Byrd in earlier Antarctic expeditions and, at the time of the interview, was a bit of a maverick, certainly in appearance, with long, non-reg hair and a bushy mustache. The captain got right to it, asking Ensign Baker what it was he had accomplished in life that qualified him for an arduous wintering over. Dave's answer included his winter climbs in the White Mountains of New Hampshire and Mount Katahdin, his rock climbing in Alaska, his cross-country skiing and snowshoeing capabilities and his course work at the Yale School of Forestry in mapping and related subjects. Capt. Black listened and, when Dave was finished, handed him a sheet of paper containing a list of 17 items. Next to 15 of the items he had placed a check mark.

Dave's own words best tell about the rest of the interview.

"I was so nervous that I didn't try to read what was on the paper since Capt. Black continued to speak to me. As I handed the paper back, Capt. Black explained that it was a list of qualifications that the Navy was seeking in an officer to winter at McMurdo and that, since I had 15 of the 17 qualifications, it would not be necessary to send the request to the Department of the Army to see if they had an officer with those qualities. I found the courage to ask Capt. Black two questions: first, what qualifications did I lack and second, what would be the assignment for that individual. Capt. Black answered the first question directly, 'You are not a dog sled driver, nor are you a qualified parachutist.' In answer to my second question he simply said, 'A parachuting, dog sled driver.' "

HERO'S REWARD FOR TURK. Ensign David E. Baker rigs the young husky into pulling harness for his debut as lead dog. The dogs, only 28 of whom made the grade, left for the Antarctic with their four drivers to be on hand for rescue and reconnaissance. They were used where heavy track vehicles would bog down in snow and ice.

The need for dog teams to support operations in Antarctica had been determined by RAdm. Byrd who believed there might be circumstances when neither ski-equipped aircraft nor helicopters would be able to reach the crew of an aircraft forced to land in the interior or otherwise inaccessible part of Antarctica.

By late October 1955, after a summer and fall of training under the tutelage of MSgt. Dutch Dolleman at the Chinook Kennels in Wonalancet, N.H., and a highly abbreviated course in parachuting at Naval Air Station, Lakehurst, N.J., Dave and LTjg. Jack Tuck (later to be the first Naval Officer in Charge of the South Pole Station) found themselves en route to McMurdo on board the Navy icebreaker *USS Edisto*. Some fifty days later, on December 20, the *Edisto* put ashore a team of 11 dogs and their masters, Baker and Tuck. Three days later, after a 44-mile traverse on the sea ice of McMurdo Sound, the team arrived at Hut Point. This was their first, but not their last, sledging trip with the dogs on ice and snow. In New Hampshire they had used a stripped-down jeep chassis as the "sledge" and forest roads as the training ground. Six weeks later the rest of the dogs—19 more—would arrive on board the *USS Arneb*, the TF-43 Flagship.

Fortunately the dogs were never required in any kind of rescue operation. On two occasions they were put "on alert," but in both cases the need to use dogs was unnecessary. Although never used for a rescue, the opportunity to drive a team of dogs in Antarctica was a life changing experience for Baker. Trips to Cape Evans and Cape Royds as well as trips on the sea ice of McMurdo Sound provided experiences similar in many ways to those who had gone before. Dave explains, "Spending the night in a tent when the outside temperature is 25 below and your source of heat is a Primus stove similar to the ones used by early Polar explorers gave us a real appreciation for what it must have been like 45 to 50 years earlier. We were never put to the test in the way the great polar explorers were. We were the beneficiary of better clothing and better sleeping bags. We never spent more than five nights on the ice, but there were many things in the daily routine of driving dogs under those conditions that had not changed in 50 years. It was very different from camp life at McMurdo Base."

When Dave returned to the United States in early 1957, after 15 months on the ice, he met with his mentor, Bob Bates. Bob remarked about the mission of the dog team as a para-rescue team for bringing survivors back to be picked up by helicopter or ski-equipped aircraft. Bob observed that the first rule of mountain rescue is that you should be able to come out the way you went in. However, Dave, in spite of years of trying, has never been able to levitate and long ago gave up trying.

Dave is currently the Treasurer of the American Polar Society and continues to cross-country ski. He returned to Antarctica two years ago with Lindblad Expeditions. He has lectured extensively about his Deepfreeze I/II experiences as a dog sled driver. He retired as a captain from the Navy and now lives in Medford, Oregon. ❑

Historic Flight to the South Pole

On Oct. 31, 1956, at 8:34 p.m. local time, the first aircraft ever to touch down at the South Pole skied to a halt atop the Antarctic ice sheet at 90 degrees South latitude. The U.S. Navy R4D, piloted by Lt. Cmdr. Conrad C. "Gus" Shinn, had been christened *Que Sera Sera*, the title of a popular tune that won that year's Academy award for Best Song.

Immediately after the plane halted—with engines running to avoid a freeze-up (a practice still followed to this day)—U.S. Navy Adm. George J. Dufek, commander of Operation Deepfreeze, stepped out onto the Ice along with his senior staff aviator, Capt. Douglas Cordiner, USN, to plant the Stars-and-Stripes at the Pole. They were the first to stand there since Briton Robert Falcon Scott did so more than 40 years before. Norwegian Roald Amundsen had beaten Scott in his race to the Pole. Amundsen's party survived the 800-mile return trip; Scott's did not.

Others had flown over the Pole. Most famously, Navy Adm. Richard E. Byrd was the first in 1929. But none had ever landed. No one even knew precisely what the challenges would be or if they could be overcome. In that sense, Gus Shinn's touchdown foreshadowed Apollo 11's moon landing, 13 years later.

Dufek stepped into a landscape almost as unfamiliar.

"It was like stepping out into a new world. We stood in the center of a sea of snow and ice that extended beyond our vision," Dufek wrote in his 1956 memoir *Operation Deep Freeze*. "How deep that ice lay beneath our feet, no one has yet determined. Bleak and desolate, it was a dead world, devoid of every vestige of life except us."

After 49 minutes on the ground and a risky take-off, made even more complicated when the plane's skis initially stuck to the ice, the men left the Pole to return to what is now McMurdo Station, NSF's logistics hub in Antarctica.

That first landing was followed almost immediately by "Seabees," U.S. Navy construction workers using air-dropped materials to build the first permanent station at the Pole. A team, co-lead by scientist Paul Siple and Navy Lt. John Tuck, Jr., began the first winter ever spent at the South Pole in March of 1957 as part of the global series of observations carried out in the International Geophysical Year (IGY).

In the intervening years, even more has changed at what was the site of Shinn's difficult landing and where now Amundsen-Scott South Pole Station rises from the ice.

Now, where relatively primitive stations were set up to take weather and other measurements, a sophisticated telescope a cubic kilometer in size and designed to detect infinitesimally small particles called neutrinos is being built into the ice sheet itself. Other massive radio telescopes are being built to scan the skies of traces of images of what the universe looked like in its infancy. Laboratories, carrying on the pioneering work of IGY in an unbroken scientific chain, monitor global air quality and seismic waves.

But despite the changes of the past 50 years, all who fly the route from McMurdo Station to Amundsen-Scott—scientists whose discoveries drive the missions—owe a debt to the crew of *Que Sera Sera*. ❑ ***This story is a compilation of several news reports from various sources.***

Capt.Roger W. Luther

It is my sad duty to report on the death of Captain Roger W. Luther, USN. Ret., who was commander of the icebreaker *USS Edisto* (AGB-2) during "Operation Deepfreeze" over the Antarctic summer of 1955–1956. Captain Luther was just twenty days short of his 95th birthday when he passed away June 8, 2006, in Hawaii. He is survived by his wife and four children, two grandchildren, many shipmates, other friends, and me. Roger Luther often told me that making a safe navigable route through the ice with the *Edisto* was one of the most rewarding professional experiences of his maritime career. Knowing Roger Luther as I did, for over 55 years, I think he also really liked busting up ice with a really big boat! During the cold war, Captain Luther commanded the *USS Maury* (AGS-16) to the port of Odessa on the Black Sea (USSR)—at that time in history, a significant and politically delicate command. In World War II, he served on various Navy vessels and retired from the Navy as a Captain, only to then become a Master Unlimited (oceans) and First Class Pilot (harbor pilot) upon Puget Sound and surrounding waters. He was a true gentleman, an optimist, my hero, my relative and my touch with the larger world. And, most of all, he was my longest personal friendship; he was my pal and my "skipper." Calm seas and tailwinds, my captain. ❑ ***This remembrance, written by Capt. Luther's cousin, Roger G. Chatten, Ph.D., USCG*** ❑

Antarctic Notes

Japanese Target 860 Whales in Annual Hunt

***Associated Press*, 16 November, 2006, by Eric Talmadge**—Japan's whalers plan to kill 850 minke and 10 fin whales on their annual Antarctic hunt. The government-backed six-ship fleet left Wednesday from Shimonoseki.

Urgent Repairs at 'Home of the Blizzard'

***Australian Associated Press*, 7 November 2006**—A team with a federal grant of A$320,000 is facing an uphill battle to complete vital work aimed at saving Sir Douglas Mawson's wooden hut at Cape Denison, said deputy field leader Ted Bugg. An unusually harsh winter and savage blizzards this week have left the main building of the 1911–14 expedition all but buried under metres of snow and ice. The five-member team has less than six weeks to clad four remaining roof planes. The team could at best expect 7–14 days to complete a job that would, under normal conditions, take nearly three times as long. Since 1997, five previous expeditions organised by the Mawson's Huts Foundation have resulted in other parts of the site being restored and many artefacts being documented.

Rabbits Trigger Landslides, Kill Penguins

***Reuters*, CANBERRA, 24 October 2006**—Twenty landslides caused by feral rabbits have destroyed penguin colonies on Macquarie Island, and millions more seabirds are under threat, the environmental group WWF said. More than 100,000 introduced rabbits have stripped native tussock grasses, causing loss of nest cover at breeding grounds. One large slide at Lusitania Bay, on the eastern side of the island, killed an unknown number of birds, including penguins.

Ozone Hole Double Record Breaker

***NASA press release*, 19 October 2006**—This year's ozone hole over Antarctica has broken records for area and depth. From Sept. 21–30, 2006, the average area of the ozone hole was the largest ever observed, at 10.6 million square miles. On Sept. 24, it was equal to the record single-day largest area of 11.4 million square miles, reached on Sept. 9, 2000. The most recent assessment concludes that the ozone hole will not fully recover until 2065.

Larsen Collapse Due to Global Warming

***Reuters*, 16 October 2006, by Alister Doyle**—Scientists say they have found the first direct evidence linking the 2002 collapse of the Larsen B ice shelf to global warming. Writing in the *Journal of Climate*, the group led by Gareth Marshall of the British Antarctic Survey said there was evidence that global warming and a thinning of the ozone layer had strengthened winds blowing clockwise around Antarctica. The Antarctic Peninsula's chain of mountains used to shield the Larsen ice shelf on its eastern side from the warmer winds. "If the westerlies strengthen, the number of times that the warm air gets over the mountain barrier increases quite dramatically," said John King, a co-author. Average summer temperatures on the northeast of the Peninsula had been about 2.2°C over the past 40 years. But on summer days when winds swept over the mountains into the area, the air could warm by 5.5°C, reaching 10°C.

Two Icebreakers Needed to Protect U.S. Interests

***National Academies Press* press release, 26 September 2006**—The U.S. should build two new icebreakers to protect its interests in the Arctic and the Antarctic, says a Congressionally mandated report from the National Research Council. The ships would replace the oldest of the nation's four icebreakers, *Polar Sea* and *Polar Star* (each 30 years old). Even under the best conditions, however, the new icebreakers would not enter service for another eight to ten years, the committee estimated. The full 185-page report, "Polar Icebreakers in a Changing World: An Assessment of U.S. Needs," can be read online at www.nap.edu

Russia to Get Biggest Breaker by 2007

RIA Novosti, MOSCOW, 13 September 2006—The Russian fleet could receive a new nuclear-powered icebreaker by the end of this year. Under construction since 1989, the 25,000-tonne *50 Years of Victory*, 159m long and 30m wide, will be the world's largest nuclear-powered icebreaker, designed to break ice up to 2.8m (9.2ft) thick.

Antarctica Warmed Over Past 150 Years

***University of Washington press release*, 5 September 2006**—Despite recent indications that Antarctica cooled considerably during the 1990s, research published Aug. 30 in *Geophysical Research Letters* suggests that it has been getting gradually warmer for the last 150 years, a trend not identifiable in the short meteorological records and masked at the end of the 20th century by large temperature variations. Numerous ice cores collected from five areas allowed scientists to reconstruct a temperature record that shows average Antarctic temperatures have risen about 0.2°C, or about .33°F, in 150 years.

Ice Core Evidence of Skyrocketing CO_2

***Reuters*, NORWICH, 4 September 2006**—Air from the oldest ice core confirms human activity has increased CO_2 in the atmosphere to levels not seen for hundreds of thousands of years. Bubbles of air in 800,000-year-old ice drilled in the Antarctic show levels of CO_2 changing with the climate. "Carbon dioxide has increased by about 35% in the last 200 years," said the leader of the science team for the ten-nation European Project for Ice Coring in Antarctica (EPICA), Dr Eric Wolff of the British Antarctic Survey. The level of CO_2 over most of the past 800,000 years has been 180–300 parts per million by volume (ppmv) of air. Today it is 380 ppmv. Said Wolff: "The most scary thing is that CO_2 today is not just out of the range of what happened in the last 650,000 years but already up 100% out of the range."

Aussie Runway Attracts Other Nations

***Australian Associated Press*, 16 August 2006, by Denis Peters**—The U.S. and other countries are interested in using Australia's nearly-completed 4km blue ice runway near Casey, the Government said. Environment Minister Ian Campbell is confident of attracting American Antarctic scientists, who currently use Hercules aircraft to fly from Christchurch, to switch to the Hobart-based service. "We're pursuing that very aggressively because that will help to underwrite this massive (A$53 million) investment by the Australian Government," he said, adding: "There is no reason why this runway could not be used down the track for a tourism operation."

Snowfall in Interior Antarctica Unchanged

***Associated Press*, ORONO, Maine, 11 August 2006**—University of Maine climate-change researchers report in today's issue of *Science* that snowfall in interior Antarctica has not changed significantly in the past 50 years despite recent winter warming trends. Snowfall amounts have averaged roughly one to four inches or so since the 1950s, said Paul Mayewski, director of the university's Climate Change Institute and one of 16 collaborators on the project. The lack of significant change in snowfall is not unexpected and shows that climate change has yet to affect interior Antarctica, Mayewski said. But all other signs indicate that it's only a matter of time before the climate warms up, resulting in increased snowfall, he said. **[Editor: Another paper in the same issue reports that satellite studies suggest the Greenland Ice Sheet has been shrinking about 57 cubic miles a year since 2004, a threefold increase in ice-loss rates since 1996.]**

Navy Names New Ships for Byrd and Peary

***Department of Defense press release*, 31 July 2006**—The Navy announced the naming of the newest combat logistics force underway replenishment naval vessels, *USNS Richard E. Byrd* T-AKE 4 and *USNS Robert E. Peary* T-AKE 5. Each will be 689 feet long, 106 feet wide and able to carry 41,187 metric tons of cargo, a maximum of 26,000 barrels of fuel and 1.38 million sq. ft. of cargo. The diesel-electric-drive ships will have a range of 14,000 miles at a speed of 20 knots.

Hydrogen to Power Australian Field Camps

***Australian Antarctic Division press release*, 13 July 2006**—Expeditioners at Mawson Station and a nearby penguin-monitoring field camp at Béchervaise Island will soon bake bread, heat their huts and power their laptops with hydrogen. The project, the first of its kind in Antarctica, aims to investigate safety and operational aspects of using hydrogen. "We have already reduced our fossil fuel use at Mawson by installing two wind turbines," said AAD engineer Peter Magill. "We can reduce it further by using any electricity generated by the turbines, in excess of station requirements, to produce hydrogen."

Ancient Seal Remains Reveal Warmer Antarctica

National Geographic News, 26 June 2006, by Adrianne Appel—Freeze-dried whiskers, skin and bones of southern elephant seals provide evidence that Antarctica was much warmer not long ago, report Brenda Hall, a glacial geologist at the University of Maine in Orono, and co-authors in today's *Proceedings of the National Academy of Sciences*. The 1,000- to 6,000-year-old elephant seal remains were found in abandoned breeding colonies in Victoria Land. They are the first hard evidence for a warming period in the region between 2,300 and 1,100 years ago. Elephant seals thrive in a sub-Antarctic climate and require a coastal home where they can move between land and sea to breed and molt. Not only did elephant seals live in the Ross Sea area thousands of years ago, but during the two periods when they were present, Adélie penguins apparently disappeared from the region.

Fish Antifreeze Made in Pancreas

New Zealand Press Association, 22 June 2006, by Kent Atkinson—A New Zealand researcher and two American colleagues have solved the mystery of how Antarctic fish manufacture the "antifreeze" which allows them to live in icy waters. Clive Evans, a professor of molecular genetics at the University of Auckland, and Paul Cziko and Chi-Hing "Christina" Cheng of the University of Illinois, found the antifreeze glycoproteins originate primarily from the exocrine pancreas and the stomach, they said in a paper released online ahead of regular publication in the *Proceedings of the National Academy of Sciences* later this week.

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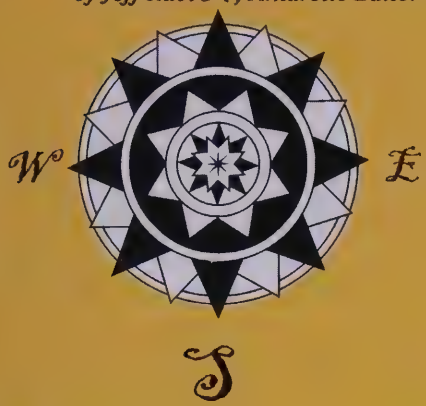
Now We Know

Due South

by Jeff RubiN, Antarctic Editor



For more than a century now, since the days of Amundsen and Scott, people in Antarctica have wondered about leopard seals.

The lithe, reptilian-looking predators—picturesque devourers of penguins and other seals—seemed like they could be dangerous to humans.

But no one was certain about *Hydrurga leptonyx*, despite clues.

Thomas Orde-Lees, storeman on Sir Ernest Shackleton's *Endurance* expedition of 1914–17, was skiing over sea ice when a "sea leopard," as they were then called, chased him both on top of and beneath the ice before being killed with a rifle by another expedition member.

T.E. DeLaca, J.H. Lipps and G.S. Zumwalt detailed their encounters with leopard seals during more than 1,200 dives at Palmer Station and other sites along the Antarctic Peninsula in the May/June 1975 *Antarctic Journal of the United States*. While none of the encounters could be described as attacks, seals behaved aggressively toward divers several times. In one confrontation, a leopard displayed sophisticated hunting behavior, "frequently position[ing] itself between the divers and the only shoreward escape route possible. It also positioned itself in the sun. The divers were thus forced to look into the sun to keep the seal in sight."

The authors concluded: "These seals must be regarded as dangerous to humans in or near the water."

Canadian Gareth Wood, who in 1985–86 walked with Robert Swan and Roger Mear to the South Pole (where they met embarrassingly hostile American authorities intent on keeping private expeditions out of Antarctica), relates a terrifying experience in his 1996 book, *South Pole: 900 Miles on Foot*.

Out walking on sea ice, Wood paused at a tide crack glazed with new ice. A leopard burst through the "eggshell covering" and chomped on his right leg, dragging him back toward the hole. Even as fellow expeditioners kicked at the seal's head with cramponed boots, the leopard held on, leaving Wood feeling "as powerless as a mouse caught by a cat." The seal eventually let go, but departed only after again seizing Wood, who was left with long gashes down to the bone.

As more and more tourists began showing up in Antarctica, stories of leopards gnawing on the rear ends of Zodiac pontoons became more frequent, although no tourist—including the several hundred who have scuba dived in Antarctic waters—has been injured by one.

M. Jessop (www.photo.antarctica.ac.uk)

But now there can be no doubt about it.

Leopard seals, in the words of a chilling new 93-page report, "Interactions Between Humans and Leopard Seals"*, by Shona F. Muir, David K.A. Barnes and Keith Reid, "can display predatory behaviour towards humans." ***(Online at www.antarctica.ac.uk/News_and_Information/news_stories/2006/final_leopard_seal_report.pdf)***

Kirsty Brown, a 28-year-old British Antarctic Survey (BAS) marine biologist, was drowned by a leopard seal while snorkeling at Rothera Station on 22 July 2003. The seal pulled Brown to a depth of 70m, resurfaced a kilometer from the point it seized her and released her only when it was hit with a shovel by members of a rescue party in a boat. Despite a prolonged resuscitation attempt, Brown was declared dead little more than an hour later. This is the only known fatal attack by a leopard seal on a human.

The new report, sponsored by the Kirsty Brown Fund and hosted by BAS, is the result of a year-long review of the available information about humans and leopards in the Antarctic. More than 180 questionnaires and interviews were analyzed to assess the risks posed by leopard seals; the results were published in the March 2006 issue of *Antarctic Science*.

"Large predators," the report says, "that are known to sample novel prey, may consider humans as a potential prey...especially where human populations are expanding into new areas and thus providing new opportunities for interactions with predator species," such as tigers in India, crocodiles in northern Australia, mountain lions in California and polar bears in the Arctic.

"The human presence in Antarctica is increasing," the report says. "Inevitably, this means that humans are likely to encounter leopard seals more frequently." The potential for such encounters is highest near research stations and along tour ship routes.

After analyzing the BAS dive data, the authors conclude that the likelihood of interacting with a leopard seal is approximately 1 in every 200 dives. The likelihood of sustaining a physical injury from a leopard is approximately 1 in 9,000 dives.

Interactions occurring at the ice edge—where leopard seals seek out prey—resulted in the highest response from the animals, which may mistake people standing at the ice edge for penguins.

This makes sense. Vastly larger numbers of penguins stand on ice edges in Antarctica than do people, who also arrived on the Ice only recently when compared to penguins.

A photo essay titled "Deadly Beauty" by underwater photographer Paul Nicklen is featured in the November 2006 issue of *National Geographic*. The dramatic opening image shows a close-up of a leopard's jaws agape. Nicklen writes: "I expected this 12-foot-long female to flee with her catch, a live penguin chick, but instead she dropped it on my camera. Then she opened her mouth and engulfed the camera—and most of my head. After 45 minutes of more threats, she finally relaxed and ate."

Of the most amazing photo in the spread, showing a penguin being both decapitated and disemboweled by a thrashing leopard, Nicklen writes: "It took 1/2,000th of a second to freeze the action; at the time

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George Washington Gibbs, Jr.

Navigating in a White World at the Bottom of the Earth

by Leilani Rashida Henry

© Leilani Rashida Henry

OUTSTANDING ZEAL AND ENERGY': Gibbs aboard the Bear.

"Jan. 1, 1940—En route for Little America. Today is New Year's Day and although I am at sea, almost at the bottom of the world, I am still ok... Today is very beautiful at sea and there are many icebergs to be seen. Also whales. We ran into some very thick ice packs and lost a day trying to find a hole through the ice but couldn't. So, we turned back and after getting out of the ice trap we headed west. This is my first time of seeing day light for twenty-four hours."—Journal of George Washington Gibbs, Jr.

In the spring of 1939, my father re-enlisted in the U.S. Navy after a four-year stint. The new collaboration between the Navy and Admiral Richard E. Byrd was creating military jobs, and although he knew nothing about Antarctica, George Washington Gibbs, Jr. applied—along with 1,999 others—to join the U.S. Antarctic Service Expedition of 1939–41, Byrd's third trip to the icy continent.

My father was accepted as one of the 125 servicemen, scientists and dogsled drivers who would journey south to Antarctica. George believed it would be an honor to serve with Byrd and to make history. Perhaps he also thought it would give his life and career the boost he was seeking. A young black man of his day had to maneuver strategically within the system in order to use his real talents, for the status quo for Negroes (African-Americans) was menial jobs.

In spite of his 14-hour days aboard ship as a mess attendant, my father wrote in his journal every day for six months during his first round-trip to Antarctica from November 1939 to May 1940. He also kept a journal on his second voyage from November 1940 to May 1941 to pick up the expedition parties from their bases in Antarctica.

Sadly, my father's journals were misplaced for nearly 30 years among some of his other papers. My mother, Joyce Gibbs, eventually found them, preserved in a plastic case, only after George's death on his 84th birthday, November 7, 2000. Although my father often talked with me about writing his autobiography, he never mentioned his journals. Important as they were to him, he must have thought they were lost forever.

When I held my father's journals in my hands for the first time, I was incredibly excited. I read every word—fortunately, I am one of the few people who loved and appreciated his angular, but flowery handwriting! Even today, the cursive script in black fountain-pen ink looks remarkably fresh.

Now that there is documentation with these journals, it is easier to re-create George's stories. They are amazing and simple at the same time. I have confirmed that everything he wrote is consistent with the official records kept by the expedition and the Navy. (My research has been conducted at the Library of Congress, the National Archives, and the Byrd Polar Research Center at Ohio State University.)

On November 22, 1939, George joined the *USS Bear* along with 75 other men and 75 huskies. The *Bear*, a 68-year-old wooden sailing ship, had rescued Lieutenant A.W. Greeley's stranded crew from a North Pole expedition in 1884. She was later equipped with a diesel engine. At Byrd's request, the *Bear* had been taken out of a California museum in the summer of 1939 and transported to Boston for preparations, including steel reinforcement to allow her to break through pack ice. Byrd sailed aboard the *USS North Star*, which also carried the newly-built Snow Cruiser, designed for over-snow travel.

When George reported for duty at the Boston Navy Yard, no one there had heard of the *Bear*. He was sent to a private shipyard in Chelsea, Mass., but saw no Navy ships there. Finally, he asked a yard workman where he could find the *Bear*. The workman pointed: "That's it." George replied, "Oh no, I mean the *USS Bear*." The workman insisted: "That's it." George had a hard time believing that the ancient-looking vessel would take him halfway around the world to Antarctica—and he was not alone in his doubts.

On board, George soon found himself with a hammer in his hand, chipping paint off the walls. Although Admiral Byrd had the utmost confidence in the old *Bear*, the crew held a different view: They agreed that the ship would not get out of the yard and that the Antarctic was out of the question!

Nevertheless, the excitement of the voyage began immediately. On November 23, 1939, the day after sailing, George wrote:

"Seamen of yester year often told me that in the old days they had wooden ships and iron men and that today they have paper men and iron ships. I had taken it as a joke, but after last night on the *USS Bear*, I was convinced that they were right. Everyone lost his food. Even I lost mine. Today is very beautiful and the *Bear* is sailing nicely on her way. My next problem is taking a bath in cold water, and keeping clothes clean out of a bucket. Regardless of hardship, we are determined to stand up as long as the *Bear* does."

On the day after Christmas, he recorded rough seas off southern Chile:

"En route for Little America, caught in the 'roaring' fifties. This ship is rolling and pitching so, until we can't cook at all. No one can sit at a table to eat. We ate some sandwiches for a lousy meal. Water is coming over the port of the ship. We were called out of our beds at three a.m. to check the

water that is coming down the hatch. I also notice that three a.m. is as bright as eight a.m. As I turn in my bunk, I wonder how long it will be before one can eat a meal."

Life aboard the *Bear* was filled with work. As an assistant to the cook and baker, George prepared vegetables, inventoried provisions, served meals and sanitized the galley and food-storage spaces. Still, when the ship wasn't "being tossed about like a coin," as George put it, the *Bear*'s crew took comfort in small pleasures: music from a Victrola, mail, news of the outside world, good food.

> *When the* Bear *came up to the ice close enough for me to get ashore, I was the first man aboard the ship to set foot in Little America and help tie her lines deep into the snow. I met Admiral Byrd; he shook my hand and welcomed me to Little America.*

Part of George's character was his constant willingness to go "beyond the call of duty." His eagerness to serve was rewarded on January 14, 1940, when he wrote:

"Anchored this morning in the Bay of Whales...digging holes in the ice with picks and shovels. This was the only way of tying the ship up along the ice. There aren't any docks at all, was I surprised?? When the *Bear* came up to the ice close enough for me to get ashore, I was the first man aboard the ship to set foot in Little America and help tie her lines deep into the snow. I met Admiral Byrd; he shook my hand and welcomed me to Little America and for being the first Negro to set foot in Little America."

George may have been excited about the possibility of being one of the first black people in Antarctica*, but he also probably just wanted to get solid land—or at least ice—beneath his feet again after the long voyage!

Admiral Byrd hinted at George's positive impact on the expedition, writing later in George's autograph book: "Best wishes to one who has done so much to make our cruise more comfortable and pleasant.—R.E. Byrd." This praise meant a lot, especially considering that George's rank was mess attendant, the lowest rank on the ship.

My father rarely complained about his humble status aboard the *Bear* or the manner in which he was treated. Although Negroes were denied any duty in the Navy, except those connected with the kitchen, before 1945, George was an integral part of the crew. Each crewman had specific roles, but when something needed to be done, everyone pitched in, volunteering—or in some cases, being volunteered. George's character and easy-going disposition flourished under the excellent leadership of the ship's commanding officer, Lt. Cdr. Richard H. Cruzen, and navigation officer, Lt. George Dufek.

A few journal entries, however, reveal that George experienced some hardship as a person of color. Near the end of the first trip, he wrote on April 18, 1940:

"Tonight finds us still with good weather although she is still rolling. Oh well this is the *Bear*. There are two naval officers aboard...who at times make this cruise very hard for me and if it wasn't for the Captain aboard here, I would certainly be put ashore on arrival or at least on another U.S.N. ship. But for his sake and mother's, I will try to stick it out, at least until I get home."

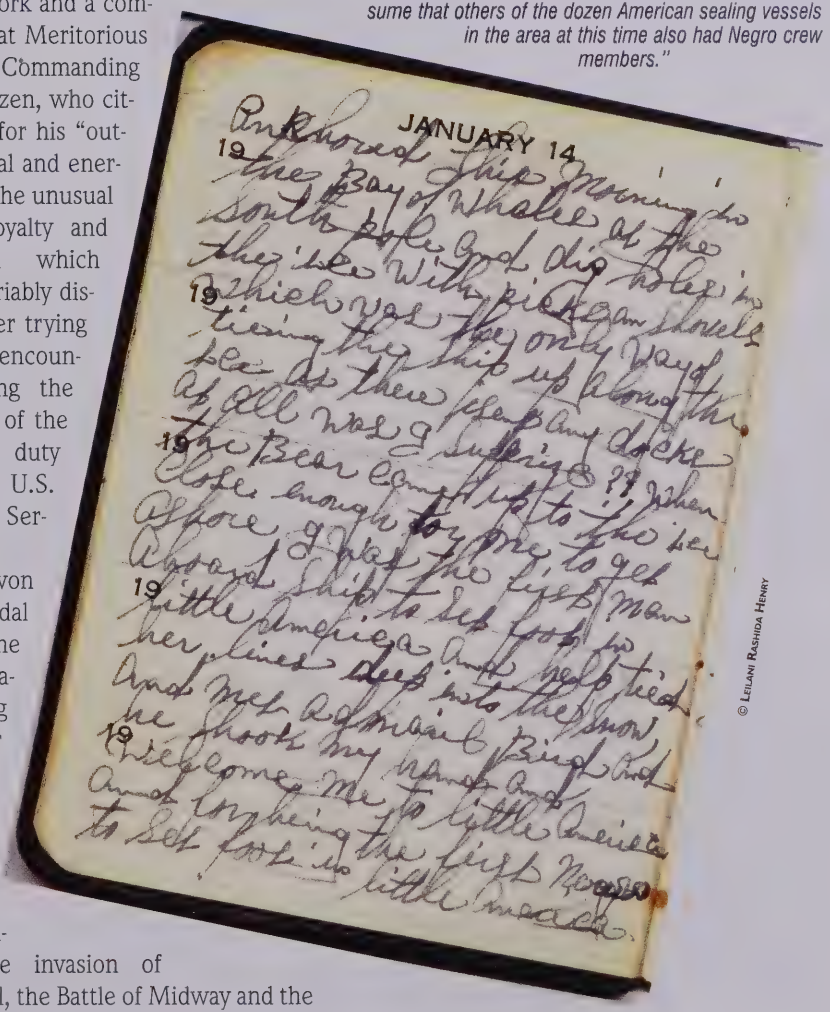
George did stick it out. His 24 years of naval service included a Silver Medal for his Antarctic work and a commendation at Meritorious Mast by Commanding Officer Cruzen, who cited George for his "outstanding zeal and energy, and for the unusual spirit of loyalty and cooperation which he has invariably displayed under trying conditions encountered during the assignment of the vessel for duty with the U.S. Antarctic Service."

George won another medal serving in the South Pacific during World War II, when he saw action in five major engagements, including the invasion of Guadalcanal, the Battle of Midway and the third Battle of Savo Island.

After graduating from the University of Minnesota in 1963, George settled in Minnesota. At the time, it was one of coldest and whitest states in the U.S. But cold didn't bother George. Neither did white people. In Antarctica, he'd had plenty of pivotal experiences with both. ❑ *© Leilani Rashida Henry, 2006.*

Leilani Rashida Henry is transcribing her father's journals and writing a book about his experiences in Antarctica. She is seeking a publisher and can be reached at (303) 838-3818 or via email at <LRH@beingandliving.com>. Her website is www.beingandliving.com

**EDITOR'S NOTE: The earliest-recorded black person in Antarctica is Peter Harvey, born in Philadelphia in 1789, a member of Nathaniel Palmer's five-man crew during his 1820 voyage aboard the sloop* Hero. *Another early black visitor to Antarctica was Cato Tobias, Jr., aged 18, a sailor aboard the ship* Huron *of New Haven, Conn. when it sighted the Antarctic coast a few months after Palmer. In his 1955 book* The Voyage of The Huron and The Huntress, *whaling historian Edouard A. Stackpole, the former director of Mystic Seaport, notes on p78 that Huron's "cook and the steward were mulattoes, named William White and Cyrus Treadwell, respectively. Two others in the crew were colored men." For more information, see "Negro Seamen Present at the Discovery of Antarctica," by Sidney Kaplan, University of Massachusetts, in* Negro History Bulletin, *Vol. XIX, No. 4, January 1956, p80. Edouard Stackpole says in the same article: "It is fair to assume that others of the dozen American sealing vessels in the area at this time also had Negro crew members."*



Megaliner to the Antarctic

***Sydney Morning Herald*, 2 September 2006, by Andrew Darby**—It has the largest casino afloat, four pools and a nightclub high above the water. This summer, *Golden Princess* will be the first megaliner to sail to Antarctica, taking thousands with it.

The appearance of the 109,000-tonne ship on the list of Antarctic tour options is alarming the frozen continent's managers and environmentalists who say this demand for the cool new destination is more than rescuers and the environment could cope with if anything goes wrong.

As they enjoy the swank of a modern cruising giant, perhaps from one of 710 staterooms with private balconies, *Golden Princess*'s passengers are scheduled to tick a list of favourite Antarctic Peninsula sights: Elephant Island, Deception Island, Esperanza.

Usually these places are limited to smaller ships built to withstand sea ice. *Golden Princess* is not listed as ice-strengthened by the authoritative Lloyd's Register.

The expected 2500 passengers and 1200 crew aboard should expect to be clear of pack ice as they dip below 60 degrees south in February—but they are likely to encounter icebergs.

Signatories to the 28-nation Antarctic Treaty are concerned about potential environmental damage from a grounding or sinking of a large vessel, the region's search and rescue capacity, and the impact on wildlife and shorelines of landing a large number of people. They have agreed to ask the International Maritime Organisation to adapt its polar shipping code for large vessels in Antarctic waters.

An official observer at Antarctic Treaty meetings, Alan Hemmings, said *Golden Princess* was the biggest passenger ship to visit Antarctica.

"These vessels are gargantuan enterprises, and if things go wrong, their potential to cause human disaster or impact on the environment is considerable," said Dr. Hemmings, of the Antarctic and Southern Ocean Coalition, an environment group.

"There is the lack of search-and-rescue capacity in the event of misadventure involving such large numbers of people, and the devastating impact on normal Antarctic operations of having to respond to a problem with a vessel of this size. When you look at who would have to be rescued, the numbers get even more alarming."

Many smaller Antarctic tour operators have long held concerns about repeated visits to wildlife breeding colonies. Last summer total Antarctic visitors exceeded 30,000, and the number is expected to rise this year.

Golden Princess did not appear to be landing passengers in Antarctica at this stage, Dr. Hemmings said. He said the US had blocked an attempt by Antarctic Treaty nations to limit landings by large ships. ❑

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Editor's Note: *Princess Cruises sent* The Polar Times *a four-page and a seven-page statement in response to the press notices about the voyage. Excerpts include: "*Golden Princess *will sail in the waters of the western Antarctic Peninsula in January/February 2007 for approximately 72 hours, during which time passengers will observe the surrounding environment from the ship. Passengers will not be landed. We are a member of the International Association of Antarctica Tour Operators (IAATO). We will be cruising in a relatively ice-free area, and the ship will be in the hands of two experienced captains, plus an experienced ice pilot and an IAATO observer. Though the ship's capacity is slightly larger, we have agreed we will carry no more than 2,700 passengers when she sails to Antarctica. The ship's crew is approximately 1,120.* Golden Princess *will stay in areas that have been surveyed and are known to have deep water and navigated many times by other ships.* Golden Princess *will not enter areas marked on the chart as 'unsurveyed' or 'inadequately surveyed.'* Golden Princess' *draft at 26 feet is similar to ships we, and others, have operated in this area in the past.* Golden Princess *will be cruising at a speed of 8 knots or less, which would allow for precise, accurate position fixing and with her thrusters (six transverse thrusters, three bow thrusters and three stern thrusters, which when operated together can move the ship sideways at 5 knots) and rudder configuration, allow her to be intricately maneuvered.* Golden Princess *does not have an ice-strengthened hull, and we don't believe this is necessary based on the time of year and our route. We want to avoid the ice, not break the ice. If* Golden Princess *receives a report of large concentrations of ice on her intended route or encounters ice in large concentrations, the route will be modified to take the ship around the ice and not through it. At all times when operating in the vicinity of ice, the captain and the experienced ice pilot will be on the bridge and additional lookouts posted." Answering the questions 'Where could you possibly evacuate passengers to? Where would the assistance come from?' Princess Cruises said only: "We have an emergency rescue and evacuation plan in place, and this is in agreement with IAATO and its member companies, who would work together to ensure the safety of all visitors to Antarctica.* Golden Princess *will be visiting the region during the height of the season and, as a result, many ships are in the area so there would be rescue resources available in the vicinity." Princess' statement concluded: "The risk to the safety of the passengers, crew or ship when* Golden Princess *transits through her programmed itinerary in the Antarctic waters will be no greater than those on many of her other worldwide itineraries."*

Due South (continued from Page 13)

all I saw was a splash and storm petrels and gulls gathering for scraps. This efficient killing machine prizes above all else penguin stomachs stuffed with krill."

An accompanying essay quotes Goran Ehlme, a Swedish cinematographer who has spent years in the water with leopard seals.

"It makes a better story to tell about a ferocious animal than it does to tell about a curious one," he says. "People tend to judge animals in frightening moments. But these seals, they are mostly curious."

Yet Ehlme admits in an interview on the web site animal.discovery.com that his own first underwater encounter with a leopard seal—"up in my face, opening her jaw"—was "definitely the most frightening experience I ever had in my whole life."

Another time, a leopard attacked him as he was clearing brash from a hole he'd cut through sea ice. "It was like out of a horror film," he says on animal.discovery.com. "She started trying to bite me everywhere, and I mean everywhere! She was going to pull me under the ice like she does with penguins to kill and eat them."

Goran Ehlme may be right when he says leopards are "mostly curious" about divers and people standing on sea ice. But given their size, their strength, their maneuverability—and now their record—he may be wrong. ❑

Measuring the Top of the Bottom of the World

By John Spletsstoeser and Damien Gildea

Antarctica's highest peaks have, over the past eight years, become a second home to Damien Gildea.

The 37-year-old Australian climber has led seven expeditions to Antarctica—four of them to the continent's highest mountains. He has made rare ascents of high Antarctic peaks such as Mounts Shinn, Gardner and Craddock; summitted Antarctica's highest mountain, 4892m Mount Vinson, three times; and made nine first ascents of other high peaks. He has climbed on the Antarctic Peninsula twice and is one of only a small handful of people to have guided a full sledging journey to the South Pole.

Gildea is also the author of the 1998 reference book, *The Antarctic Mountaineering Chronology*, the 2004 map *Livingston Island* (1:100,000) and, with Camilo Rada, the 2006 topographical map *Vinson Massif & The Sentinel Range* (1:50,000), which contains much of the new elevation data collected by Omega Foundation expeditions over the last five years. The private, not-for-profit Omega Foundation of Incline Village, Nev., has been active in Antarctica since 1998.

Climbing with a Purpose

Gildea and his team climb with a purpose: They are measuring Antarctica's high peaks, calculating extremely accurate summit elevations with Global Positioning Satellite (GPS) receivers.

During the 2006-07 austral summer, Gildea will lead the "Unclimbed Antarctica" team to try to ascend the last virgin peaks in Antarctica's highest mountains, the Sentinel Range.

The three other team members are Chileans Camilo Rada, 26, who has been on two previous Omega Foundation expeditions to the Sentinel Range, and Maria Paz Ibarra, 28, one of South America's leading female climbers, and American Jed Brown, 23, a 2004 magna cum laude graduate of the University of Alaska Fairbanks (UAF) who has made numerous technical ascents in the mountains of Alaska and is currently working at UAF on mathematically modelling the Antarctic ice sheet.

The "Unclimbed Antarctica" expedition comprises three stages to be achieved over 60 days, climbing in three sections of the Sentinel Range, home to eight of the 10 highest mountains in Antarctica (the other two, Mounts Kirkpatrick and Elizabeth, are in the Queen Alexandra Range of the Transantarctic Mountains). If the expedition is successful in its main objectives, it will mark a significant point in the history of Antarctic exploration: All the highest mountains in the highest range will have been climbed (see box).

The Sentinels are the northern segment of the Ellsworth Mountains, discovered by the American aviator Lincoln Ellsworth on 23 November 1935, during his flight across Antarctica from Dundee Island near the tip of the Antarctic Peninsula to a point just short of Admiral Byrd's Little America on the Ross Ice Shelf. Ellsworth, however, saw only the northern part of the Sentinel Range; he was too far away to view the range's highest peaks to the south, including Mount Vinson.

Measuring the peaks requires conquering them first. The climbers place GPS units on the summit and leave them there for up to 10 hours, to collect as much satellite data as possible in order to achieve a very accurate elevation. Mount Vinson's newfound elevation, for example, is thought to be accurate to within 3cm.

Rock or Hard Ice, Not Snow

"Usually we try to put the GPS on the highest rock, even if a snow mound nearby is a tad higher," Gildea says. "This was the case on both Vinson and Craddock. Sometimes this is not possible, like on Shinn and Gardner. We make sure it is on hard ice, not snow, nor on anything that might fall down anytime soon, and this ice seems fairly consistent, especially on Shinn, I noticed. There is minimal precipitation in Antarctica, so actual snow buildup is never a problem, and the wind takes off whatever little bit might accumulate. Of course, in 50 years it might be a different story."

Stage one of this summer's expedition is to attempt Mount Rutford, the highest unclimbed mountain in the range, thought to be around 4450m. This newly-named* mountain honors geologist Robert Rutford, member of several U.S. expeditions to Antarctica and leader of the Minnesota Ellsworth Mountains Party of 1963-64 (and a vice president of the American Polar Society). Mount Rutford is the highest point of the Craddock Massif (named for American geologist Campbell Craddock, active in Antarctic research beginning in 1959-60, who died 23 July 2006; see his obituary on page 38), which lies to the south of the Vinson Massif, above the (also newly named) Gildea Glacier.

The Unclimbed Antarctica team will ski to the mountain from Vinson Base Camp and attempt Rutford via the steep west face. The team will place a Trimble 5700 GPS on the summit for at least 10 hours, thereby completing a survey of this massif started last summer when two members of the team climbed a new route on Mount Craddock, the southernmost peak of the Craddock Massif. After climbing and measuring Mount Rutford, the team will return by ski to Vinson Base Camp and, if time allows, do some climbing and GPS work in the vicinity of Mount Vinson.

Around mid-December the team plans to fly north to the Embree Glacier, for stage two. This area, around 50km north of Vinson, has only been visited twice before, in the late 1990s, and contains several high virgin peaks just below the 4000m mark. The Unclimbed Antarctica team will attempt some of these peaks and conduct further GPS surveys in this little-known area.

In stage three, the team will reconnoiter a new escape route out of the Embree Glacier by early January, then ski back south to Vinson Base Camp, climbing peaks along the way. The three main objectives for this stage are Mounts Anderson, Giovinetto and Ryan. Before the naming of Mount Rutford, Anderson was considered the highest unclimbed mountain in the range. Having no easy way up, it has never been attempted. Giovinetto has never been tried from the west, but an attempt from the east in 2002 was repelled by extreme cold and the sheer scale of the climb. Mount Ryan, another recently-named peak, lies just north of Mount Gardner, which was climbed by members of this team last year.

For updates on the expedition's progress, visit www.theomegafoundation.org❑ ***On 18 August 2006, the U.S. Geological Survey Advisory Committee on Antarctic Names (ACAN) approved 48 new names for features on and around Mount Vinson. Nine peak names were proposed by Damien Gildea, who did not propose his own name for any feature. The U.S.G.S., however, chose to name Gildea Glacier in his honor.***

Antarctica's Top Ten

1.	Mt. Vinson	4892 m	16,046 ft
2.	Mt. Tyree*	4852 m	15,915 ft
3	Mt. Shinn	4660 m	15,288 ft
4	Mt. Gardner	4573 m	15,045 ft
5	Mt. Kirkpatrick*	4528 m	14,852 ft
6	Mt. Elizabeth*	4480 m	14,694 ft
7	Mt. Rutford*	4450 m	14,596 ft
8	Rada Peak	4402 m	14,439 ft
9.	Mt. Craddock	4368 m	14,327 ft
10.	Mt. Epperley*	4359 m	14,298 ft

*no GPS measurements made by Omega Project.

Dome Dedication Remembered

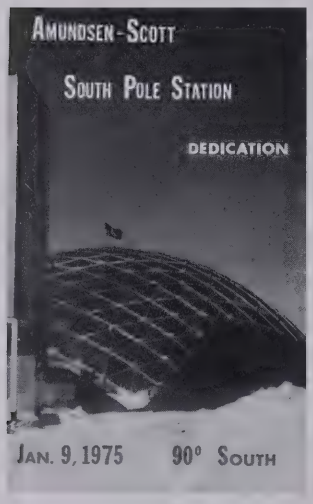
By Capt. Eugene W. Van Reeth, USN (Ret.)

Reading about the new El Station at the South Pole in the July 2006 *Polar Times* and noting the paragraph "Dome: Cold, Dark—and Soon, Gone," took me back to the Dome's dedication in 1975. It seems impossible to believe that was more than 31 years ago.

The Dome was completed and dedicated during my tenure as the Naval Support Force Commander, and I remember many details of it very well, having visited many times during and after its construction.

I also remember the original Pole Station, having visited it for the first time during the 1965-66 summer season and many times thereafter. Dedicated in 1957 and designed to last only a few years, it consisted of a number of pre-fab buildings parachuted to earth by U.S. Air Force C-124 Globemaster aircraft, then laboriously assembled by Navy Seabees. It had been deteriorating ever since it was built, despite increasing yearly maintenance, and by 1965 it was completely buried by snow. To this day, I wonder how it possibly lasted until 1975. If only some of its early denizens could see the new El Station, they'd be flabbergasted.

Construction of the Dome station, designed by the U. S. Navy's Facilities Engineering Command, commenced in November 1971. It was built primarily by Navy Seabee battalions and completed during the 1974-75 austral summer.



PROGRAM COURTESY OF E.W. VAN REETH

The station dedication was a major event on the Ice, requiring some fine-tuned logistics to bring together an appropriate gathering of VIPs for the occasion. They came from around the U.S. and Norway, being transported first to Christchurch and thence McMurdo for marshalling and briefings. At McMurdo, I and others hosted them at several cocktail and dinner parties, took them on tours of the base—particularly the science areas and laboratories—and escorted them to the Dry Valleys and Capt. Scott's huts at Hut Point and Cape Evans. Many guests were also taken out on an icebreaker for an ice-breaking demonstration, and New Zealand's Scott Base even treated a few to a dog-sled ride.

OFFICIAL U.S. NAVY PHOTOGRAPH BY PHI R.W. MILTON; NEG. # XAM 504365-1-75

Mr. Phil Carnes tries to remember some facts about the new South Pole Station while giving a briefing to the DVs in attendance for the dedication.

The distinguished visitors (DVs) were flown to the Pole *en masse* in an Antarctic Development Squadron SIX (VXE-6) LC-130 Hercules piloted by the squadron's commanding officer, arriving shortly before the scheduled time for the ceremony. It was a gorgeous day—very cold, of course, with only a slight breeze.

The ceremony in the new station's BioMed lab, at 1500 hours on 9 January 1975, was brief but impressive. Several VIPs made remarks and Dr. H. Guyford Stever, director of the National Science Foundation, read a message from President Gerald R. Ford who said that "By making our South Pole facility accessible to scientists of all nations, we reaffirm our devotion to the ideals of cooperation that are characteristic of Antarctica and that have extensively benefited mankind."

A beautiful commemorative coin had been struck for the occasion and mounted in a handsome display case, one being presented to each of us.

Afterward, there was a brief social gathering for the group, with non-alcoholic punch and *hors d'oeuvres* prepared by the station cook. Countless photographs were taken, most of them outside by the "barber pole."

Then the group reboarded the waiting Hercules for the trip back to McMurdo, then Christchurch and home. Letters received subsequently from many of them thanked all concerned for the trip and for creating "memories of a lifetime." ❑ ***Capt. Eugene W. Van Reeth, USN (Ret.) was the Commanding Officer of Antarctic Development Squadron SIX (VXE-6) in 1968-69 and the Commander, Naval Support Forces, Antarctica in 1974-1976.***

Dome Dedication Attendees

Capt. Neal W. Clements, USN, Commander, Naval Construction Battalions, Atlantic; **Dr. Martin Finley**; **Mr. A. N. Fowler**, Assistant Director, Office of Polar Programs, NSF; **Walter Froelich**, U.S. Information Agency; **Dr. Tore Gjelsvik**, Director, Norwegian Polar Institute and President, Scientific Committee on Antarctic Research (SCAR), **Dr. Norman Hackerman**, Chairman, National Science Board; **Cdr. Fred C. Holt**, USN, Commanding Oficer, Antarctic Development Squadron SIX (VXE-6); **Lieut. Cdr Merlen F. Howe**, USN, Chaplain Corps; **Dr. Robert E. Hughes**, Assistant Director, National and International Programs, NSF; **Jim Johnson**, President of civilian contractor Holmes & Narver; **Dr. Thomas O. Jones**, head of U.S. Antarctic Research Program; The **Hon. J. J. "Jake" Pickle**, Congressman (D-Texas); **Jack Renirie**, NSF public information officer; **Dr. Gordon DeQ. Robin**, Director, Scott Polar Research Institute, Cambridge, England; **Armistead I. Selden, Jr.**, U.S. Ambassador to New Zealand; **Mrs. Ruth Siple**, widow of Dr. Paul Siple, first South Pole Winter-Over Science Leader; **Mr. Homer Skarin**, representing the House Committee on Appropriations; **Dr. H. Guyford Stever**, Director, NSF; **Vice Adm. James B. Stockdale**, USN, Administrative Superior, Antarctic Navy Units; **Mr. Robert B. Thomson**, Director, New Zealand Antarctic Division; **Capt. Eugene W. Van Reeth**, USN, Commander, Naval Support Forces, Antarctica; **Mr. Richard Wolak**, first Winter-Over Leader, New South Pole Station ❑

South Pole Station Update

by Jeff Rubin

They built it—and now they're coming, fast.

Even before the new Elevated Station is completely finished and dedicated, two ambitious science projects are moving "full steam ahead." That means Pole's population is growing again.

"We could spike at 262 people at several points this season," says station construction project manager Jerry Marty.

With the El Station accommodating only 150 people, he adds, "We're right back to where we were with the old station: 100 people sleeping in Jamesways."

And the spacious new dining area, filled with natural light and views over the polar plateau? "We are now challenged with, 'Hurry up and eat because we have to wash the plate for the next guy," Marty says.

"The success has been so great that it's overwhelming us," Marty says. "We're scrambling, trying to understand how to support the science from a resource standpoint."

No one foresaw ten years ago, Marty says, that a single South Pole science project would require as many as 45 people.

For the Icecube Neutrino Observatory (icecube.wisc.edu), that many scientists, support personnel, drillers and deployers (who unpack, calibrate and attach the observatory's instrument globes to their cables, then lower them into the ice) come to 90°S and stay all season.

The number of personnel for the 10-meter South Pole Telescope (spt.uchicago.edu) is approaching that of IceCube. The telescope also requires 31 flights to bring the necessary construction material to Pole. With 580,000 of the 620,000 pounds of steel currently on site, construction is under way.

Courtesy of the National Science Foundation

'RIGHT BACK TO WHERE WE WERE': Aerial view on 22 October 2006

Meanwhile, "remediation of station exfiltration" (translation: stopping heat loss) continues this summer on the upwind sides of pods A and B. With scaffolding and cranes, three tasks are being done in unison. The champfer panel at the edge of the roof line is removed so that bituthene—a sticky sealant that should stem heat loss—can be applied to joints where panels abut and where they meet structural steel framing. Once the champfer panel is reseated, insulating Tyvek wrap is placed over it, then the station's gun-metal gray siding goes on .

The goal, Marty says, is to have the station's entire windward face done by the end of the summer.

Because the bituthene (pronounced 'BITCH-a-thayne') must be warm to remain pliable, applying it is tricky in the extreme sub-zero temperatures at Pole. Cold makes the bituthene shatter, so a tent is set up on the El Station's roof over the current working area. Inside the tent, a Herman Nelson heater warms the section of structure being removed. In addition, a heated black box was designed to heat the bituthene before application.

Once the bituthene is in place, the section of structure is quickly re-installed and the building is sealed. As the bituthene cools, it is insulated by the structure and should not become brittle.

An infrared camera is used to evaluate the effectiveness of the repair, and Marty says heat loss has been "immensely reduced."

Discussions about dismantling the Dome for a Seabee Museum continue. "We are proceeding with efforts to comply with their request," Marty says, "but not in a way that jeopardizes the budget." ❑

Antarctic Notes (continued from Page 12)

Dry Valleys Cool—and Tiny Worm Turns

***New Scientist*, 21 November, 2006, by Amanda Leigh Haag**—Diana H. Wall, director of the Natural Resource Ecology Laboratory at Colorado State University in Fort Collins, is to make her 16th trip to the Dry Valleys next month. She and her team of "worm herders" study Antarctic nematodes, *Scottnema lindsayae*, just one millimeter long, which occupy the top rung of the food chain in this pared-down ecosystem, and their role in the process of carbon turnover, how carbon travels through the ecosystem. *Scottnema* is responsible for about 10 percent of the carbon processed in the Dry Valleys soil ecosystem. But the Valleys have experienced a cooling period, which in turn has led to cooler and drier soils. As a result, the *Scottnema* population has shrunk by 65% since 1993, a loss of a third of the total carbon cycling in the ecosystem.

Ross Ice Shelf 'Might Break Off' Without Warning

***Australian Associated Press*, 29 November 2006**—The Ross Ice Shelf could break off without warning, says a New Zealand-led drilling team that has recovered three million years of climate history from sea-floor cores drilled near Scott Base. Initial analysis suggests the ice shelf had collapsed in the past and had probably done so suddenly. "If the past is any indication of the future, then the ice shelf will collapse," said the team's co-chief scientist, sedimentologist Tim Naish. Once dating of the sample is completed, researchers will be able to look at what the ice shelf was doing during periods when scientists know from other evidence that it was 2°–4°C warmer than today.

Leopard Seal Whiskers Reveal Diet and Climate

***The Australian*, 19 July 2006, by Brendan O'Keefe**—A leopard seal's whiskers can tell it where to find food but they can also tell researchers what, and in what quantity, the seal has eaten in its lifetime. "Different organisms have different carbon-nitrogen isotope signatures," said Australian Marine Mammal Research Centre director Tracey Rogers. "Using these, we can can tease apart what proportion of the signature is from penguins, krill, fish or seals at any one point of the whisker." She will use her method to test how climate change affects the seals' diets. Early readings show that penguins and krill are decreasing as a source of seal food, and salps, a jellyfish-like creature that prefers warmer water, are increasing. ❑

Fond Farewell to Dave Norton as Arctic Editor

Regrettably, I must report to APS members and other readers of *The Polar Times* that Dr. David Norton has submitted his resignation as Arctic editor. His learned contributions to this publication will be sorely missed.

Over the past five years, Dave has exerted a commanding presence over the Arctic section of our magazine. His column, "Due North," has consistently provided insightful analyses of the major events impacting the Arctic land masses, the waters thereto and the peoples that either live there or venture forth upon them. In each issue in which it appeared, his "Oil and Gas Digest" can only be described as a true labor of love, given the ups and downs and ins and outs of the volatile and vital Arctic energy equation which has gripped the nation politically and economically for decades.

Dave has also brought to our pages a wide variety of original material of his own, as well as articles by his colleagues in the world of science describing their accomplishments and adventures in northern climes.

Moreover, he has consistently identified special interest articles from outside sources for reprint in *The Polar Times*. All this material has been timely, center-stage and engaging.

As with so many of our readers, Dave loves books, and he has introduced us all to countless new editions in his Arctic book review section. Indeed, in the recent past we have had to insert book review addendums with *The Polar Times* to capture all the new titles in circulation, a large portion having found their way to his desk.

We will be seeking a successor to Dave in the coming months and suffice to say, whoever is chosen will have an XL pair of snowshoes to fill.

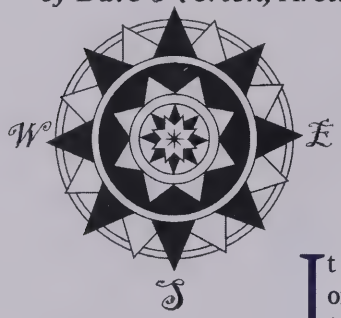
Thank you, Dave, from all of us involved with *The Polar Times*, and know that the Officers and the Board of Governors of the American Polar Society join in expressing their gratitude and appreciation for your outstanding contributions to the Society and its voice. ❑

Cliff Bekkedahl, Managing Editor, **The Polar Times**

Continuity Thoughts

Due North

by Dave Norton, Arctic Editor



It took most of a year (i.e., since the January 2006 issue of *The Polar Times*) for our analysis of the real inequities of prices charged for Arctic-derived petroleum energy to get picked up by political opportunists. How rural Alaska was suffering from the high cost of heating and other fuels, lamented in the pages of *The Polar Times*, was then flung back in the face of Alaska's power brokers. The *Anchorage Daily News* captured the embarrassment and confusion among some analysts stirred by President Hugo Chavez and Venezuela-owned Citgo offering free heating fuel to hard-pressed villages in rural Alaska (see "Arctic Oil and Gas Digest," this issue).

There have been ample grounds for contrition by the oil and gas industry since *The Polar Times*' comparisons of the plight of Hurricane Katrina victims with that of rural Alaska inhabitants, as measured by what has become unaffordable to each of those groups. The midwinter oil spill in the Prudhoe Bay Oilfield complex (*TPT*, July 2006: 13) unleashed a surge of critical review of oil industry profits compared to the same industry's alleged scrimping on self-policing and checking on the integrity of corrosion-prone feeder lines in the Prudhoe gathering area for the Trans-Alaska Oil Pipeline. Criticism increased in summer of 2006 when pipe corrosion forced BP to shut down half of the Prudhoe Bay field. Perhaps it is not surprising that Congressional agitations to open the Coastal Plain of the Arctic National Wildlife Refuge to exploratory drilling have been muted since that spill became an obvious bottleneck in domestic oil production for the U.S.

As if that were not enough, Alaskans, many of us unstreetwise, were stunned by the evening news some months back. In the style of "This just in…" we heard a cadence of bulletins from National Public Radio affiliate stations (no less) of ongoing FBI raids on certain of Alaska's legislators' offices in Anchorage and Juneau. Alaska's elected officials in Juneau suspected of federal offenses? Well, yes. In fact, some legislators had formed a group self-derisively named "Corrupt Bastards Club" that happened to be associated with heavy contributions from the corporation and pro-petroleum lobbying organisation, Veco.

On top of that confusion, Alaska voters were asked to weigh in on a number of ballot initiatives and planks in platforms in the 7th November 2006 General Election. For example, natural gas reserves on Alaska's North Slope: what to do with them? For most of four decades, a parade of candidates for our votes have dangled the prospect of a gas pipeline before us, economic salvation or economic boom times reminiscent of the giddy oil pipeline construction flurry, back in 1974–1977. Chief alternatives remain: 1) an all-Alaska gas pipeline routing to a liquefied natural gas port in ice-free water, such as Valdez; 2) an industry-determined routing, probably entirely overland from Prudhoe Bay to Alberta, an alternative in which Canada stands to be rewarded for diligence in doing homework, investment and foresight; 3) another industry-determined routing from Mackenzie River Delta to Alberta, which would eventually draw Alaska's untapped natural gas reserves into production, in which Canadians benefit even more promptly than in the second alternative.

Cautionary Note: On the light side, my ignorance of Arctic tourism before assembling pieces of this issue of *The Polar Times* was profound. Attempts to reduce my ignorance led me to commit an embarrassing *faux pas*, a digital-age misstep, at which I seem to excel, and for which I paid dearly. I was trying to see whether universities and colleges offered courses that could reduce the sorts of ignorance from which I was suffering regarding tourism in the Arctic. A few careless mouse clicks and keystrokes while rummaging through Internet sites placed me on an electronic list of "hot" prospective students for a new class of entrepreneurs. Soon, I was inundated by e-mails and phone calls. Primarily, staff recruiters at online universities (i.e., ones delivering classes and awarding degrees over the Internet, of which the University of Phoenix is the largest U.S. example) were after me. For months, I was targeted night and day by rapacious recruiters trying to enroll me for

degree programs at one or another U.S. online university. Should you *ever* become a similar target for recruitment to online education, be forewarned: these folks can be irritatingly oblivious to local time zones. It took months to outlast recruiters' hopes of enlisting me as a trainee tour agent or as some other type of student willing to buy my way into a degree track aimed at some form of tourism entrepreneurship.

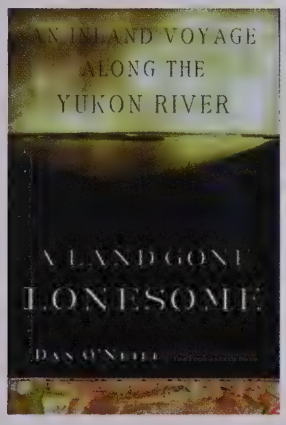
In analysing the visitor industry (as in analysing ecosystems) I found it helpful to keep in mind the distinction between producers and consumers. Producers seek to appeal to consumers, with the goal of separating consumers from as much of their money as possible. Many government oversight agencies operate in various circumpolar nations, although the boundaries between regulatory and facilitating activities seem whimsically drawn. Even more perplexing are the trade membership groups (NGOs and UN organisations) to which producers may belong. After weeks of sifting through materials from eight circumboreal nations relating to tourism, an impression formed that the U.S. and Alaska differ from all other slices of the northern visitor industry pie, in being a lawless frontier, with few constraints placed upon corporate greed. Steve Colt at the Institute of Social and Economic Research in Anchorage became my helpful tutor in matters related to tourism. In his words, I was missing the point with the majority of visitors to Alaska, only half of whom penetrate farther than 60°North. "I'm convinced," he said in an e-mail, "that most visitors are drawn to Alaska more by its being western than its being northern." After 2000, oversight of the Alaska visitor industry was privatised. Now the industry's statistics are based on self-reporting through a trade organisation. Can a day of reckoning like that of Venice be avoided?

Adieu! I am vacating the Arctic editorship of *The Polar Times* after five years. It is time for someone else to take a run at helping Cliff, Jeff and the American Polar Society make this publication indispensable to growing numbers of thoughtful readers and members. Instead of soliciting, screening, and writing articles for the American Polar Society, I'm drawn back into more Northern field research and teaching before it is too late. It is not just that future field seasons are ebbing out of my personal hourglass. More worrisome to me is that field research at high latitudes may lose its traditionally well-grounded connections to the environment. If we are hurtling toward a point beyond which all high-latitude research is conducted by investigators who swoop from one spot-sampling station to the next by helicopter, icebreaker, or fixed-wing aircraft, who will be left knowing how to get around using less consumptive forms of surface transportation? If I can contribute to safeguarding these traditional environmental connections and be surer that younger folks will too, we can share optimism that nobody will ever feel compelled to write a lament entitled, "The Arctic Gone Lonesome." ❑

About Our Centerfold

Matanuska Glacier, seen from the Glenn Highway in mid-September 2006. (Photo by Dave Norton) ❑

In keeping with a continuity of thoughts, here follows a recent book review by Dave Norton:



A Land Gone Lonesome

By Dan O'Neill. New York NY: Counterpoint Press, 2006. ISBN: 1-5823-344-5. 245 p. maps, afterword, index. Hardbound. US$24.95; Cdn$32.95

Review by Dave Norton, Arctic Editor

Border regions, where differing cultures or political systems meet and trade influences, make especially fertile subjects. Between Dawson City, Yukon and Circle City, Alaska, lies the quintessence of Canada's and the United States' northwesternmost frontiers, a subarctic region romanticised in tales of gold-seeking prospectors of the late 19th and early 20th centuries. The Yukon River's banks and the country stretching back uphill from the great river and its larger tributaries used to be thinly but steadily populated. The size of the indigenous population living in this region before the Klondike Gold strike is a guess. By 1900, an estimated 500 to 1,000 people lived between Eagle and Circle. At mid-20th century, Dawson City, Eagle and Circle had all been reached by roads. In 1973, a formal survey estimated that the human population living away from road access between Eagle and Circle consisted of 16 year-round residents. In 1977 a count of such residents (including children) found 28 (p. 136). In all, during the two decades between 1970 and 1990, O'Neill could identify 80 individuals grouped into 35 households who lived outside organized, road-connected communities between the Canada-Alaska border and Circle. By 2005, the number of families permitted to continue living within the Yukon-Charley Rivers National Preserve had dropped to zero (p. 233).

O'Neill's surveys of space and time by means of several canoe trips through this country can impress readers in several ways. One impression is the improbable tectonic, glacial and erosion events that formed the Yukon drainage (p. 23–25). Another is to marvel at how many different explorers between 1778 (James Cook, p. 14) and 1883 (Frederick Schwatka, p. 31) fitted pieces into the geographic puzzle of the source and all the dendritic tributaries of the Yukon River. Yet another impression is of the subtle yet significant differences between two nations and their two respective territorial governments' public policies toward the contiguous land and river systems coursing through this boundary region ("Canadians have an impressive knack for 'stick handling' around dicey problems." p. 44).

Something commonsensical yet heroic has seeped out of this country, although the author does not hurry to judge this seepage as sinister. Percy DeWolfe, for example, spent 35 years delivering the mail between Dawson and Eagle, back and forth, summer and winter, from 1915 through 1950. A letter made the 160-km trip either way by dog team or riverboat in about four days. Once the U.S. and Canadian postal systems replaced Percy's surface delivery with airplanes in 1951, his 160-km, four-day trip was perverted into a 5 000-km odyssey through Whitehorse, Vancouver, Seattle, and back north via Anchorage and Fairbanks. Now, although it is moved by high-flying aircraft that reach two-thirds the speed of sound, a letter spends the first half of its average 10-day transit between Dawson and Eagle traveling 2 500 km almost directly away from its destination (p. 25-27). That vignette early in the book suggests nothing more than innocent absurdity resulting from technological innovations.

Another couple of vignettes concern the modern tour boat, *Yukon Queen*, hustling passengers between Eagle and Dawson. This modern high-speed catamaran lacks any of the leisurely and stately luxury of the

CONTINUED ON NEXT PAGE

BP Under Pressure as Regulator Attacks Pipe Leaks

ARCTIC OIL & GAS DIGEST

***New York Times*, 2 September 2006, by James Doran**—BP, which could face criminal charges over an oil spill in Alaska, came under further pressure yesterday as it was criticised by U.S. federal regulators for failing to maintain its pipelines there properly.

The U.S. Department of Transportation's Pipeline and Hazardous Materials Safety Administration (PHMSA) has for the past six months conducted tests on "transit lines" across America owned by BP and its competitors. Its study showed that BP's competitors had all well maintained their transit lines, which are currently unregulated, and there was little difference between them and the maintenance programmes used for regulated pipelines.

BP, however, fell short of standard industry practices in keeping its transit lines well maintained, the PHMSA said.

"Other operators kept their transit lines up to par, and it is now evident from the data we gathered that BP did not," a PHMSA spokesman said.

The oil company has insisted that the discovery of corrosion in the transit lines was a shock because the oil carried by the pipeline was thought to be safe and that its maintenance and monitoring of the pipeline was in line with industry practices.

Thomas Barrett, PHMSA administrator, said yesterday: "Quite frankly, the type of problem you have seen at Prudhoe Bay with BP on these low-stress lines, we have not seen replicated elsewhere in the country."

BP did not return calls seeking comment yesterday. ❑

A Land Gone Lonesome (cont. from previous page)

steam-powered sternwheelers that plied this section of the Yukon River for 88 years (1867–1955, p. 6). Instead, O'Neill finds *Yukon Queen*'s "...sleek, swept back lines reminiscent of absolutely nothing in this country" (p. 36). Worse, passage of this noisy, fuel-guzzling vessel with its payload of 104 passengers throws breaking waves ashore on both banks of the Yukon River that have caused a number of observers to wonder at the destruction of vegetation by erosion undercutting the banks and the fatal grounding of fingerling salmon. Mew gulls appear to have learned to congregate for a free lunch on grounded juvenile fish at the twice-daily approaching roar of the *Yukon Queen* (pp. 20-21). Here, technological innovation hints at more sinister conclusions about this land "going lonesome."

This book is about people as much as it is about the environment or environmental policy. *A Land Gone Lonesome* features characters of near-legendary dimensions. They include the enigmatic Dick Cook of Eagle country (p. 92–117), and firebrand Joe Vogler (p. 202–220) who rose and fell as a maverick miner and a maverick politician. Had I not happened to know both men, I might have found it hard to accept them and some of their associates as nonfictional characters.

O'Neill carefully credits the National Park Service and other federal agencies with helping to avoid some boondoggles in public lands management. One of these was the scarcely believable notion of building an enormous hydroelectric dam at Rampart, widely championed from 1959 until the "Rampart Project" died of its own financially preposterous dimensions (pp. 230–232). Another wild-eyed dream so far deterred by the National Park Service is that of connecting Circle City and Eagle by road paralleling the river (p. 232).

A Land Gone Lonesome gradually becomes an erie sequel to John McPhee's (1977) book, *Coming into the Country*. McPhee examined events and people in Alaska at a watershed in the state's historical development. The Trans-Alaska (oil) Pipeline was under construction while McPhee traveled the state. More relevant to O'Neill's contribution, however, the second stage of land distribution heralded by the Alaska Native Claims Settlement Act (ANCSA–1971) was underway. Teams of experts were picking lands to become preserves and parks following enactment of the Alaska National Interest Lands Conservation Act (ANILCA–1980). The title essay in McPhee's book concerned this upper Yukon River country and its inhabitants, between Eagle and Circle City. McPhee portrayed a stream of zealous latter day pioneers fleeing urban life. Effectively, they were supplanting earlier generations of indigenous peoples, miners, fishermen and trappers who were leaving the country in the 1960s and 1970s, either feet first or of their own will. This final lot of settlers was a heterogeneous amalgam of refugees, disenchanted with war, cash economies, comforts or pipelines, united by determination to live directly from the land. McPhee admired these idealists' pluck and described Dick Cook as the "acknowledged high swami of the river people." These idealists, more ready, perhaps, than their predecessors to embrace hardships, seemed immune to forebodings about how uniformed government agents might regard their spontaneous individual land tenancies in the future. Within a year of publication of McPhee's book, most of the land between Eagle and Circle had been selected for the Yukon-Charley Rivers National Preserve. Land stewardship there would be transferred after the 1980 ANILCA enactment from the jurisdiction of the Bureau of Land Management to that of the National Park Service.

O'Neill follows the fates of some of the very people introduced to readers by John McPhee three decades earlier as those who "came into the country." This chronicle introduces additional recent arrivals. Besides the fates of his and McPhee's people, *A Land Gone Lonesome* also traces the capital amassed by individuals and small family groups while they mastered the skills to allow them to subsist in this country. That capital should not be confused with monetary wealth, but it did consist of histories, valuable know-how and the dwellings these latter-day pioneers built during their tenancy on the land. As a cabin builder himself, Dan O'Neill shares with readers his appraisals of buildings constructed by former inhabitants.

This book proposes that value added to lands and waters by the human experiences gained by living upon them was irreversibly diminished upon exclusion of residents (p. 82–83). Detailed analysis of value bled from the country after 1984 as the result of entrusting stewardship over public lands to the National Park Service masquerades as a travelogue but is really a sobering lament. Appropriately enough to *1984*'s metaphoric overtones, O'Neill injects an Orwellian hue into my imagination of uniformed Park Service officials managing lands and manipulating people. Thus, thought police (however unintentionally they may have done so) have created a dystopia built around bureaucratic doublethink and justified by revisionist history in which whole inconvenient pages of the heritage of people who not long ago were living from the land are simply blanked out.

The final ironic footnote is that this review should appear in the very issue of *The Polar Times* devoted to northern tourism. How else to see the last quarter century of local history than as illustrating that the U.S. National Park Service has sanitized the landscape of the Yukon Charley Rivers National Preserve, as the agency's preferred way to open the country to tourism?

People who believe (as I used to) that protecting wilderness or recreating it by excluding human residency is axiomatically the purest form of environmental stewardship should find this book particularly thought-provoking. Dan O'Neill finishes in his Afterword (pp.238–242) by examining real-life alternatives to the policies that result in driving all people (except itinerant tourists and uniformed rangers) out of Park Service-administered lands. ❑

Rural Alaska: Free Heat From Venezuela

ARCTIC OIL & GAS DIGEST

***Alaska Journal of Commerce*, 10 September 2006, by Rob Stapleton**—Rural communities in Alaska scrambled to meet a deadline to provide information to Citgo Petroleum that may lead to 1.2 million gallons of free heating oil for rural Alaska Native communities.

"We just met a Wednesday deadline with Citgo to get them data on rural communities ... that meet their criteria for what we are calling the 'Indian' program," said Steve Sumida, deputy director of the Alaska Inter-Tribal Council, on Sept. 1.

The effort is being coordinated through the Alaska Inter-Tribal Council (AITC).

Citgo is prepared to give Alaska rural communities that have a population that is at least 80 percent indigenous 100–250 gallons of heating oil per household as soon as possible this fall, according to Citgo officials.

AITC's Sumida said that the way that the program will work is based on a model conceived by the Tanana Chiefs Council in the Interior that will have funds for the heating oil going to nonprofits on the local level, which will then provide heads of households with vouchers.

"Citgo wanted to provide 40 percent of the heating oil for the four coldest months of the winter," Sumida said. "We hope to have contracts in position within two weeks to get this started."

Sumida describes this as the first year of a pilot program that may be expanded in the future.

Sumida said that Citgo became interested in the plight of Alaska's rural villages that are running out of oil due to a lack of funds after Kodiak Island Native Daniel Ellanak made a presentation at a convention last year.

In an outreach effort that perplexes politicians in Washington, D.C., Citgo, owned by Venezuelan government, is visiting Alaska with its effort to help U.S. residents living at the poverty level. Venezuela's left-wing president, Hugo Chavez, has been at odds with the U.S. government, and his national oil company's benevolence toward U.S. consumers has been regarded as a thumbing of the nose toward the Bush administration.

This is not the first time Citgo has provided relief for financially strained Americans. Citgo delivered 5 million gallons of heating oil at a 40 percent discount to low-income residents of Philadelphia in February. The company has made similar moves in New York and New England states.

U.S. Environmental Protection Agency personnel indicated that the heating oil would be made available immediately and would be distributed through village corporation fuel storage systems. ❑

Scientists to Fake Arctic Oil Spills

ARCTIC OIL & GAS DIGEST

***CBC News*, 16 October 2006**—A group of Arctic oil spill experts who recently met in Halifax say they plan to create artificial spills in northern waters to learn how to clean them up.

Six oil companies are backing a series of international experiments aimed at improving technology for cleaning up spills.

Norwegian scientist Evor Sinksus says more oil production and shipping traffic in the Arctic has increased the risk of spills but the clean-up technology is not well-developed.

"The response is not so good in ice-covered water as it is in open water," said Sinksus, a member of an international team which includes Canadians based at the Bedford Institute in Halifax.

During the next three years, the scientists plan to create oil spills in Canada's Beaufort Sea and also in Arctic waters off of Norway.

It's the only way they can improve the technology, Sinksus said. ❑

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Polar Star May Have Made Its Last Voyage To Frozen North

***Seattle PI*, 1 July 2006, by Blythe Lawrence**—The Coast Guard icebreaker *Polar Star* floats quietly at Seattle's Pier 36.

It's seafaring weather. The sky is blue, and the waters of Puget Sound lap gently around the 399-foot ship, once the largest in the Coast Guard fleet.

Ken Stuber, who assumed captain's duties three weeks ago, would like to be under way.

He misses standing on watch, he said, directing the ship's movement at sea, "enjoying God's creation."

He's not likely to be at sea again any time soon. The *Polar Star*, the oldest of the Coast Guard's three icebreakers, has been placed on "caretaker status" by the National Science Foundation, essentially retiring it until further notice.

"Caretaker status" is a temporary measure taken to save money on the ship's operating costs until Congress decides whether maintaining three polar icebreakers, which also conduct scientific research, is necessary. The *Polar Star* has not been scheduled for further missions.

There are some who think the *Polar Star* is obsolete, Stuber said. He isn't one of them.

"I think this ship is still a viable resource for the United States, and the United States still has a viable interest in the polar regions," he said.

A decision by the Bush administration two years ago to transfer oversight of the polar icebreaking budget from the Coast Guard to the National Science Foundation drew concerns in political circles.

If Congress decides the Coast Guard needs three icebreakers, the *Polar Star* may be taken off caretaker status and renovated. If not, the ship may be decommissioned, said Richard "Mac" McCullough, who retired as the *Polar Star*'s captain at the beginning of June.

The ship looks good as new, but its technology reflects its age.

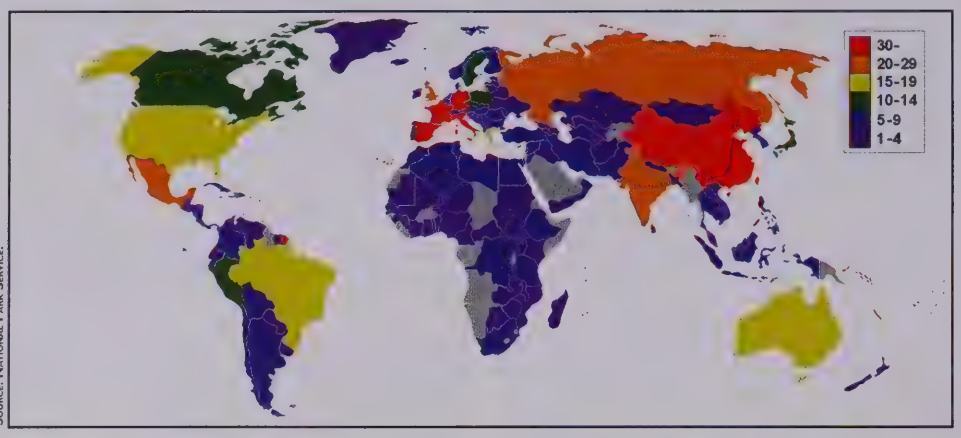
"Equipment-wise, she's at the end of her life," McCullough said. Whether or not it would be cheaper to build a new icebreaker than repair the 34-year-old *Polar Star* is anyone's guess.

"In the end it all boils down to money, and these ships are getting old and more expensive to operate," Stuber said. "The money was simply not available to fund both breakers (the *Polar Star* and its sister ship, the *Polar Sea*). The decision was made to focus funds on our sister ship."

The 6-year-old icebreaker *Healy* rounds out the Coast Guard's polar icebreaking fleet, which has headquarters in Seattle. The Coast Guard has other, less powerful icebreakers for the Great Lakes and inland waterways. ❑

Arctic Tourism: Toward Qualitative Comparisons

By Dave Norton, Arctic Editor



SOURCE: NATIONAL PARK SERVICE.

Worldwide distribution of UNESCO-sanctioned World Heritage Sites.

Archie Ferguson, a mid-20th century bush pilot in Alaska used to entertain himself at the expense of rookie teachers whenever he was contracted to fly one of them out to bush communities for assignments to public schools near Kotzebue. Upon crossing 66.5° N while airborne he would slyly cut power to the engine of his Stinson, then restore it after a brief interval, confiding to his passenger that she had survived a short stretch above the Arctic Circle where "there is no air." If his victim failed to see through the pilot's ruse, Archie would later cackle gleefully as he recounted to pals the gullibility of yet another newcomer to the North.

As illustrated by better-known rituals staged for ship and aircraft passengers crossing the Equator, we all know of several latitudinal transitions. The 38th parallel on which the Demilitarized Zone between North and South Korea is centered is a sinister convention, while the 60th parallel that conveniently distinguishes "Far North" from "somewhat North" in Scandinavia, Greenland, Canada and Alaska comes to mind more happily. In recent months, however, I have been struck by the illogical potency of two longitudinal lines of convention.

The first longitudinal convention is the International Dateline, which does its best to follow the 180th Meridian, therefore serving, along with the Greenwich (0th) Meridian, as the plane through which we slice spherical Earth into Eastern and Western Hemispheres. At the latitudes of Alaska, the International Dateline has to bend from the 180th Meridian eastward 11° around Chukotka, then westward 8° around the Aleutian Islands while doing double duty in distinguishing Monday from Sunday, and in politically separating the North American and Asian continents. I say 'politically separating' because geological and paleontological studies are persuading us that for some 100 million years the margins of North American and Asian continental plates have been joined in the region known as Beringia (see articles on Arctic dinosaurs, this issue). The usually transient interglacial warming that ended the Last Glacial Maximum of the Pleistocene raised sea level such that for about the last 11,000 years the Bering Land Bridge connecting Asia to Alaska has been awash narrowly and shallowly at Bering Strait. Cartographers based in Eastern or Western Hemispheres tend to cut off their maps at the Dateline, the citizens of a common natural heritage region ("Beringia") live under different political systems, and they look in opposite directions for guidance to set their clocks and days of the week.

A second—less momentous—longitudinal convention to the east of the Dateline is the 141st Meridian (141° W) which forms the rectilinear north-south boundary between Alaska and Canada north of the 60th Parallel. Between these two longitudinal conventions lies the wedge of the North that we know as Alaska, comprising about 1/12 of the Earth's circumference (8.3 %). Alaska's tiny pie slice of northernmost U.S. territory caters to its visitor industry under rules, etiquette, perhaps even on philosophical bases, all of which seem to contrast starkly with the other 11/12ths (91.7 %) of the circumboreal pie.

Compared to European, Asian, Greenlandic and even Canadian visitor industries, tourism in Alaska seems largely unregulated. Decision-making is left to individual tour operators to such a degree that collectively it is as if formulation and enforcement of rules (if any) might as well be in the charge of the nearest Chamber of Commerce. The first time I grasped Alaska's "Wild West" style or Libertarian approach to tourists was while listening to Leonid Nikolaev's (2006) presentation on Chukotka's tourism potential in September. I could hardly believe that our closest Russian neighbours can afford to adopt thoughtful approaches to preparing for tourism in advance of an expected torrent of visitors. After all, two Canadian colleagues analysed visitors among the Sami at the other end of the former Soviet Union, the Kola Peninsula, in the late 1990s (Robinson and Kassam 1998). They found that ethnic Russians had little choice but to be rapacious about attracting foreign tourists to trophy-harvest the very fish and wildlife resources upon which the indigenous Sami depended. That tactic became a necessity for capturing foreign currency in the '90s. Chukotka more recently seems to have survived its own post-Soviet period of chaos with commendable dignity.

However improbably, a thoughtful approach characterizes Chukotka's official approach to tourism. This same approach also connects Canadian neighbours to the community threaded together of local residents, local government, national governments and international associations that deal with the visitor industry. Head-Smashed-In Buffalo Jump, south of Calgary, illustrates (and was my first direct experience of) this threading together of interests. The popular visitor destination and archaeological site became a World Heritage Site under the United Nations Educational Scientific and Cultural Organization (UNESCO) in 1981. This World Heritage Site now boasts an excellent Interpretive Centre, which thoroughly explores the essentials of indigenous bison culture. Four additional World Heritage Sites are found wholly or partially within the Province of Alberta: Waterton-Glacier International Peace Park, Rocky Mountain Parks, Wood Buffalo Park, and Provincial Dinosaur Park. By contrast, Alaska has only two World Heritage Sites, Glacier Bay and Wrangell-St. Elias-Kluane (jointly with Canada and Yukon Territory). The U.S. National Park Service would be quick to point out that an additional seven sites in Alaska are on the "Indicator List," but nationwide, the last U.S. World Heritage designations were made a dozen years ago, and most were selected in the 1970s and 1980s. In other words, don't hold your breath that the Arctic National Wildlife Range administered by the U.S. Fish & Wildlife Service in northeastern Alaska will soon become a World Heritage Site. Much less, the dinosaur fossil-bearing bluffs along the

southern and eastern boundaries of the National Petroleum Reserve-Alaska (NPRA) administered by the Bureau of Land Management.

I detect a reluctance in the U.S. to join the U.N. agencies and their fellow-traveler regional organizations that deal with the visitor industry. I had never encountered the United Nations' World Tourism Organization (WTO) nor the Nordic Council of Ministers, which debates and sets regional policies on high-latitude Scandinavian leisure tourism (CAFF 2002) before trying to overcome my ignorance of Arctic tourism recently. Having found that vein of writing, my sense is that Alaska operates without adult supervision. Alaska, in short, as the nation's only Arctic turf, is going its own way.

Consider the literature that analyses or informs the tourism industry. Steve Colt (pers. comm. 2006) of the Institute of Social and Economic Research in Anchorage (UAA) noted wistfully that not a single refereed article on Alaska's visitor industry was cited in a recent review article purporting to summarize current research into polar tourism (Stewart et al. 2005).

The large and growing information base on tourism worldwide makes it evident to me that U.S. contributions are conspicuously rare in most of this literature. A recent 130-page WTO (2005) web publication circulated thoughtful articles in three languages on rural tourism (that's what northern high latitude tourism could be if it chose to focus on people living in the Far North) was thin on U.S. contributions. Delegates to the WTO periodic conference that stimulated this document all wore suits or fashionable ensembles, at least when their pictures were taken. By contrast with the flood of promotional materials on technical subjects sent me by U.S. online universities (see "Due North," this issue) the WTO publication dwelled on models, philosophies, estimates of the social costs and benefits of tourism, and other lofty subjects. Clearly, these folks are men and women of good will. They urge sustainability in preference to unchecked "Fordian" or mass tourism developments. And shouldn't we axiomatically be all for democratic and peace-enhancing aspects of the visitor industry?

On the other hand, each session of the 2005 WTO conference seemed punctuated by this or that self-congratulatory award ceremony for international excellence, the pictures again featuring folks in impeccable high fashion dress. Like the rumpled Andy Rooney, I'd be uncomfortable in those settings. Reading those articles did not convince me that tourism's international high priests understand at working levels what it means to invest money to reap rewards by treating Arctic visitors to unique experiences, as I have seen happen in the Arctic under the best of circumstances. Most of my discomfort with the WTO is its globalization or homogenizing of all regions, whereas my "regionalist" approach does not yield so easily to one-size-fits-all thinking.

My take on Arctic tourism reaps uncertainty as its final product. Which part of the circumboreal world makes more sense, the maverick 8.3 percent between the International Dateline and the 141st Parallel where Alaska goes its own way? Or does the 91.7 percent the rest of the way round the globe make more sense? ❑

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Arctic Tourism—for Athletes?

by Dave Norton, Arctic Editor

In late August 2006, Barrow High School's "Whalers" hosted the first formal interscholastic football game to take place in that community of 4,500 residents. Many in Barrow and elsewhere questioned the considerable expense incurred by the North Slope Borough School District in staging on frozen gravel athletic events better suited to temperate or subtropical latitudes. The Delta, Alaska, "Huskies" nevertheless flew in to Barrow (there is no road access) and played a Saturday afternoon game, which was heavily attended by Barrovians. The game's arrival was also extensively covered by news media from around Alaska and farther afield. Indeed, Entertainment Sports Programming Network (ESPN) sent a team to write and illustrate a story on the significance of this introduction of an American pastime to the Arctic. At article-submission deadline for the January 2007 *The Polar Times*, the two-part ESPN story could still be viewed on the web (http://sports.espn.go.com/espn/eticket/story?page=tundra; http://sports.espn.go.com/espn/eticket/story?page=tundrapart2).

As an early and vocal critic of this football conceit, I admit to relenting. By chance, I happened to pass through Barrow the day after the game and to ride from Barrow to Fairbanks on the same airplane that the Delta players, coaches, cheerleaders and parents took on their way home. They were a delightful and lively crowd. Their stay in Barrow must have been well managed by hospitable Barrovians, because in three days, these athletic visitors experienced far more of the community, its unique surroundings and history than tourists who typically arrive on the morning flight and depart the same afternoon. Basketball teams are smaller and rarely spend more than a single night in Arctic communities. In the seats next to mine, two Delta football players bent their heads over mementos and photographs from their stay, and I overheard one ask the other, "Did you figure out how the ocean at Barrow freezes over, but the ice keeps moving all winter?"

These guys weren't "too cool" to be intrigued by the Arctic. Maybe the expense of introducing football to the Arctic is offset by introducing the Arctic to athletes. The balanced and thoughtful ESPN story (see web addresses above) further muted my critical voice. I thank Marilyn Pico and Noe Texeira of Barrow and Henry Gueco of Fairbanks for providing images of participants and spectators. ❑

Barrow High School cheerleaders: From left, Tennessee Judkins (holding "finger"), Tiffany Hines, Nicole Corwin and Lindsaccy Heaston. Standing in back, Casey Elkins.

Arctic Tourism: A Quantitative Overview

by Dave Norton, Arctic Editor

Tourism is increasing inside the Arctic Circle (or north of 60°, or above treeline… pick from among half a dozen definitions of "Arctic").

Beyond that generalisation, there are remarkably few analyses on which anyone can agree. By some accounts, constraints upon expansion are inevitable for some sites targeted by high latitude visitors in the Northern Hemisphere. Any such thresholds will be harder to identify and any regulatory constraints on the visitor industry both more contentious and more difficult to enforce than analogous thresholds for Antarctic tourism. Overarching instruments for international or inter-corporate collaboration analogous to either the Antarctic Treaty or the International Association of Antarctic Tour Operators (IAATO--see *The Polar Times*, January 2006) simply do not cover the entire Arctic. Paradoxically, the very existence of communities and resident cultures makes Arctic tourism more obscure and resistant to generalisations than its antipodal counterpart.

Wrestling with this and other paradoxes in Arctic tourism brought to mind Yogi Berra's comment on a popular night spot: "Nobody goes there any more—it's too crowded." Arguably, the world's poster child illustrating Yogi Berra's judgmental oxymoron is Venice, Italy. Its overwhelmed inhabitants are deserting the metaphoric city of canals. Unable to abide the hassles or afford ballooning taxes, residents flee to the mainland rather than put up with the 15–18 million tourists overrunning Venice yearly. Visitors peak at about 300,000 per day during Lenten festivals, some five times the dwindling population of Venice itself (*New York Times*, 2006) and a number approximating the yearly total of visitors to all of Iceland.

"Today, the Caribbean is awash with tourists, and dozens of cruise ships are docked in every port in the Mediterranean. That makes trips to remote destinations like the Arctic an attractive option for people seeking a less crowded holiday." (*Deutsche Presse-Agentur*, 2006)

Antarctic tourism, commercial whaling and recent Venetian agonies all illustrate that a resource can indeed be over-exploited. At almost any location north of 60° N, regardless of the local visitor industry's stage of development, someone has weighed or will weigh the consequences of growth and sustainability vs. exhaustion of the resource—in this case the attractiveness of a high latitude "destination" (as the unit that attracts a tourist is known in visitor industry jargon).

Photo, Dave Norton.

Cruise ship Radiance of the Seas docked at Seward, Alaska, September 2006.

My own avoidance of hurrying hordes of high-latitude tourists betrays my preference for smaller numbers of leisurely visitors, each lingering long enough to gain something deeper than the thinnest veneer of knowledge about a destination. Low-volume, in-depth learning experiences such as Elderhostel, Camp Denali and Smithsonian Associates appeal to me. Another admission of this bias is that I have long imagined knitting together a series of "ecotours" for small groups, featuring adventures of boating, hiking, fishing and hunting with Alaska Native families…all designed to fit with the name I assign my imagined enterprise, "Off the Beaten Track." The idea has remained a dream, probably with the fortunate result that I have avoided bankrupting my family by jousting with economic windmills that favour enterprises committed to growth.

In reality, ecotourism has not proven to be the universal antidote to mass tourism that the visitor industry once envisioned. Even ecotourists run risks of overwhelming the very resources that attract them in the first place. A recent review of several low-latitude ecotourism destinations identifies penguin rookeries on islands off the coast of Chile, a Costa Rican tortoise colony and a Ghanaian rainforest canopy park as prime examples of resources on the verge of collapsing through direct or indirect effects of ecotourism (Jaffe, 2006).

During weeks of research, partly on the Internet, it proved infinitely easier to deluge myself in packaged tour promotions than it was to discover robust Arctic visitor industry statistics. By distilling a few gems from these searches, and by conferring with experts, I managed to discern that high-latitude tourism in the North runs the gamut of sizes and developmental life stages, from non-existent (or unrealized opportunities) through infancy, to the mature stage of well-organized and sustainable visitor management, and on to the brink of death by over-saturation (the Venice extreme, "…it's too crowded").

In eastern Siberia, the Chukotka Autonomous Region is barely beginning to attract commercial visitors after decades of being doubly "ice curtained," that is, closed both to foreign visitors and to visitors from elsewhere in the Soviet Union. In recent summers, numbers of leisure visitors to the vast Chukotka region have crept upward from less than 1,000 to 1,500 (Nikolaev, 2006). That head count is four orders of magnitude—10,000 times—smaller than the number of visitors to Venice. At present, it remains a breathtaking, pioneering adventure to spend time embraced by hospitality in inland or coastal communities of far eastern Siberia (Dallinger, 2006). It will be interesting to follow the fortunes of Chukotka. The Okrug government is committed to developing infrastructure that will be capable of attracting more future visitors on a sustainable basis.

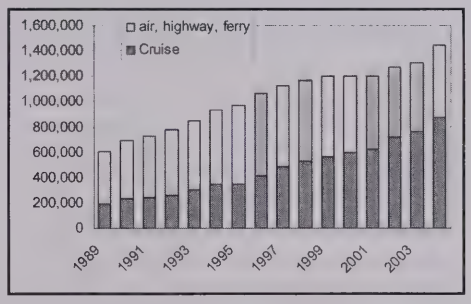
In the middle stages of development are Arctic and subarctic communities with tourist counts one to two orders of magnitude larger than that

of Chukotka and still determined to see those counts grow to bring in yet more revenue. Barrow's annual head count of visitors to "Top of the World" attractions in that community of 4,500 residents has recently reached 15,000. One of Barrow's civic leaders served as panelist at the 2006 Arctic Round Table within the 2006 Arctic Science Conference, organized by the Arctic Institute of North America. The subject of potentially increased navigability of Arctic sea routes was raised. In response to a question from the audience about increasing numbers of tour ships stopping at Barrow at either end of possible transits of the Northwest Passage or Russia's Northern Sea Route, this civic leader saw no ceiling to the numbers of visitors to whom his town could be expected to be hospitable.

Fairbanks, presently making some adjustments in the capacity of a community of 75,000 to handle visitors, hosts numbers another order of magnitude larger than does Barrow, or about 150,000 annually. Tourist bureaus for each of Canada's three territories (located north of 60°N) publish annual head counts of visitors which, combined, now have reached about 90,000, and Greenland is probably approaching half that number (extrapolated from Pagnan, 2003).

During the final official week of its 2006 summer tourism season, my wife and I drove to Seward, Alaska, on the Kenai Peninsula in September. Seward was extensively damaged by the Great Alaska Earthquake of 1964, which degraded it from a prime economic artery feeding Alaska to a financially crippled community. We wanted to learn how this subarctic coastal town that sought its economic salvation in attracting visitors is faring. An estimate of today's total annual number of visitors to Seward is elusive, but Seward's still increasing capacity to entertain visitors with diverse nearby excursions and activities betrayed a few symptoms of saturation in this community of just under 3,000 residents. The Kenai Fiords National Park and the Seward Marine Life Center with its impressive live animals are high-profile assets used by the visitor industry. When the Royal Caribbean Voyages' *Radiance of the Seas* docks at the cruise ship terminal, however, she has the capacity to disgorge a number of passengers equal to the resident population of Seward. Good luck finding a seat at any lunch counter near Seward's small boat harbour when one of these cruise ships ties up! I've heard that Seward's residents, like those of Venice, are being priced out of the community's core and have fled to its outskirts even if they continue to work downtown. On the final weekend of the summer tourism season, we were intrigued by what was advertised as a "boat show" in the small boat harbour. We were surprised to discover that we'd been drawn to a high-stakes promotion for a variety of yacht vendors. The vendors included wholesalers, retailers and yacht owners placing single vessels on the market. Brokers who staged the event were more selective of the public they wished to attract. The asking prices for the first few docked vessels we inspected persuaded us that their boat "show" was meant for the moneyed glitterati, not for us. For contrast with Seward's almost overwhelming Marine Life Center, the slick promotional approach of yacht brokers and the dining emporia studding Seward's waterfront, we enjoyed hours absorbing the less polished Seward City Museum. That museum archives the town's heritage as assorted gems of quirky history and the recorded agony of the waterfront's destruction by the earthquake, tsunamis and fires of 1964.

Because of regional inconsistencies in visitor tracking, compiling comparative circumpolar statistics is difficult (Pagnan, 2003; Stewart et al., 2005). Alaska's head count of about 1.5 million leisure visitors annually ranks it first or second alongside Norway in counts for segments of the eight-member circumpolar comity of nations, although Alaska's segment of land within the Arctic Circle constitutes only 4 percent of the planet's circum-Arctic surface. Road, air and sea access to Alaska are relatively developed and affordable for European, North American and some Asian leisure visitors. Annually, Alaska's visitors, like their subset of visitors to Fairbanks and Barrow, outnumber the year-round residents of the state by a factor of 2 to 3. In this regard, Seward's visitor headcount compared to permanent residents is probably anomalous, as Seward is unique in being accessible by rail, road and sea. Another difficulty facing analysis of Arctic tourism is that distinctions between subarctic and Arctic visits are hard to find. Half of all visitors to Alaska venture no farther north than Skagway (Steve Colt, 2006 pers. comm.), yet it is common to find Alaska's visitor stream analysed as if it were directed at a single "Arctic" geopolitical unit. Most of Alaska's tourism destinations are only "Arctic" in a vague way, perhaps more tenuously than Christchurch, New Zealand and Ushuaia, Chile are lumped with Antarctic tourism.



Growth in annual tourism headcounts to Alaska, categorized as to arrival mode. Analysis courtesy of Steve Colt, ISER, UAA, Anchorage.

In some respects Alaska's experience with the changing dimensions of the visitor stream departs from experiences just about everywhere else (see "Arctic Tourism: Toward Qualitative Comparisons," this issue). A steady increase in visitation to the 15 federal parks and preserves in Alaska, for example, "appears to be bucking a National Park Service trend" outside of Alaska. This increase amounts to an overall doubling since 1986, now pegged at 2.3 million visitors annually. (Sharp-eyed readers may think they've caught me in a discrepancy. Note that among 1.5 million visitors to Alaska annually, quite a few visit more than one National Park in a single year, and a smaller number are Alaska residents who would not be counted as landing in the state, but would be counted by Park Service turnstiles.) To put these 2.3 million visitors in perspective, National Park Service statistics in smaller states show a 5 percent decline in visitors, from 287 million in 1999 to 273 million in 2004. Some of that drop is blamed on the explosion of electronic entertainment, or the "virtual world" that runs on batteries. Park visitation by the young adult segment of the population, aged from mid-teens to mid-30s, has dwindled from 27 percent of all park visits in 1989 to 19 percent at present. Analysts speculate that the older visitors who tend to venture to Alaska closer to their age of retirement are less apt to have substituted virtual experiences of the outdoors for real ones (Medred, 2006).

Yet, in other respects, Alaska could prove especially valuable as a miner's canary for trends in the dimensions of high-latitude tourism in the Northern Hemisphere. In a semi quantitative way I have watched three trends in Arctic and subarctic Alaska since the 1960s.

One is what I call critical batch size, the maximum visitor group size that can descend upon a destination all at once. Analogous to scenarios for how medical Emergency Rooms evaluate their readiness to cope with sudden swarms of patients, "batch size" is all about coping. Above that size both hospital and hospitality infrastructures run into trouble. At a remote highway rest stop, critical batch size may be a dozen passenger vehicles containing a total of 36 people, or it might be three 40-passenger coaches. For an air-only accessed rural community, the batch size may fall between a couple of Beechcraft 1900 loads (40 persons) and two Boeing 737 passenger flights (~130 persons total). In subarctic coastal ports of call, the critical batch size can vary between several hundred ferry passengers at a time to multiples of cruise ship capacities of 3,000 persons each. Since the 1960s this batch size has tended to increase as one transportation technology has replaced another.

CONTINUED ON PAGE 31

Collaborations from the Cretaceous

by Jason Petula

Photo: Jason Petula

Thomas Adams' field illustration of a pachyrhinosaur head, based on a skull then being jacketed in the Kikak-Tegoseak Quarry.

Schoolteachers tend to work in isolation. To thwart this isolation many schoolteachers spend their summer vacations pursuing professional development experiences to revitalize their souls. I am such a teacher, and one of my pursuits took me 4000 miles from my home in Pennsylvania to the Arctic and 70 million years into the past.

My isolation abatement involved joining an integrated team of scientists along the Colville River which braids through the North Slope of Alaska. High upon a bluff overlooking the Pleistocene landscape lies a quarry of dinosaur fossils. These Arctic dinosaur fossils were the medium for my professional development.

I was given the honor of camping on a gravel bar for a month while evading armies of arctic ground squirrels after applying for a National Science Foundation program that pairs classroom teachers with scientific researchers. The Teachers and Researchers Exploring and Collaborating (TREC) program facilitates these partnerships each year. In addition to participating in an authentic scientific research expedition, teachers conduct educational outreach and synthesize curricular materials for the classroom.

I first arrived at the base of the Kikak-Tegoseak dinosaur quarry after a rather eventful four-hour ride downriver from Umiat. Our inflatable cataraft was piloted by Fairbanksan Dr. Dave Norton, a self-described generalist and one of three project investigators I worked with during the coming weeks. The quarry sits near the top of a 300-foot bluff comprised of fine-grained sediments and an encumbering quantity of mud. Dr. Anthony Fiorillo (Dallas Museum of Nature and Science) was the first to explain the significance of this remote site to me.

The dinosaurs entombed in permanently frozen sediments at the Kikak-Tegoseak site are approximately 70 million years old. During the late Cretaceous, the site was located several hundred miles closer to the North Pole than it is now. Something extraordinary happened at this site because the numbers of individual dinosaurs whose bones form the bone bed is so great. How many? In just a few days, we uncovered more than a half dozen occipital condyles. The occipital condyle is a central protrusion from the base of the skull that rests atop the vertebral column. Thus, each occipital condyle represents an individual organism. What killed these dinosaurs and what processes led to formation of this bone bed? These are some of many questions that the researchers also hope to answer by continuing to excavate the quarry.

First, how could dinosaurs even live in the Arctic? Paleoclimatic records suggest that the late Cretaceous was a very warm period in Earth's history. Some models predict annual average temperatures were in the range of those we know from southern Alberta to Portland, Oregon. University of Alaska Fairbanks graduate student Mike Tapp uncovered evidence supporting a warmer paleoclimate at this high latitude. He excavated a coalified tree segment with a diameter exceeding 30 centimetres. Presently, large diameter trees are rarely found at high latitudes. Even in a mild Greenhouse Earth, the Arctic still experienced freezing winter temperatures and long periods of darkness. How did these dinosaurs survive Arctic winters?

Understanding these unique Arctic dinosaurs requires more than analysis of the fossilized bones. Dr. Paul McCarthy, a sedimentologist from the University of Alaska Fairbanks, demonstrated that the rock encasing the fossils provides additional clues about the dinosaur's ecosystem. At the Kikak-Tegoseak quarry, the rock surrounding the fossils comprises fine-grained sediments and organic drapes. The sediment size suggests a low-energy depositional environment characteristic of low-gradient river systems such as we find in a coastal plain today. Yet, dinosaur bones must also be considered components of the sediments moved and distributed by paleorivers. How did a low-energy river system concentrate so many relatively large dinosaur re mains in one spot? Where are the intermediate sizes of sediment?

The more time I spent in the field with this integrated team of researchers, the more questions surfaced. What exactly did the North Slope look like during the late Cretaceous? How many species of dinosaurs existed? Were mammals also present? Did the dinosaurs migrate to evade inhospitable winter conditions? Or, did the dinosaurs adapt to the darkness by an adjustment to their metabolism (e.g. hibernation). Could these dinosaurs have outlasted chilly winter nights with insulating feathers?

The field experience and questions that arose were shared through daily posts to a web journal (http://www.arcus.org/trec). I also authored a weekly travelogue for my area's local newspaper. This combination of outreach offered the public a more intimate glimpse of contemporary research supported by the National Science Foundation. One story that

engaged the public centered on a remarkable discovery at the Kikak-Tegoseak quarry.

Many of fossils remains at the quarry are severely fractured, possibly due to repeated seasonal cycles of freezing and thawing associated with permafrost regions. The remarkable discovery was a possible complete skull of a pachyrhinosaur. The pachyrhinosaur was a four-ton quadruped with a beak-like mouth and a large ornate frill extending over its neck.

Extracting the prized fossil proved a race against time and nature. Each passing day resulted in portions of the quarry slumping into the turbid Colville River below.

Extracting the prized fossil proved a race against time and nature. Each passing day resulted in portions of the quarry slumping into the turbid Colville River below. Handling the fossil in haste could prove disastrous, spoiling weeks of fieldwork. The skull needed cycles of careful excavation and plaster jacket reinforcement. Under more temperate conditions, this task would be easy but mid-August 2006 ushered in twin handicaps to our urgent race to get plaster to set properly: precipitation and cold.

Through sheer will and determination, the team eventually freed the large plaster-encased skull from the icy grips of the bluff. A helicopter prepared to sling the skull back to Umiat. Before commencing the lift, the pilot delivered a grim reminder of his priorities, "If the load jeopardizes the helicopter's ability to fly, I will have to release the load." The pilot assessed the jacketed skull to estimate its weight before returning to the helicopter. If the load exceeded 900 pounds we would have to leave it behind because the helicopter was scheduled to take us out to Umiat later the same day, to end our field season.

Tension filled the air as the helicopter strained skyward. Over the deafening roar of the rotors cutting through the air to produce lift, our sighs of relief were audible when the skull rose skyward. A short time later we received word that the precious cargo touched down safely in Umiat.

In the months since the memorable field experience came to a conclusion, my professional development is gaining headway. Now I collaborate with each of the research team members to transfer the science I learned into appropriate and relevant activities for my classroom.

Recently my students were analyzing rock samples I brought from the quarry. A few of the rocks had unusual inclusions, prompting students to ask, "Mr. Petula, what are these?" Passing out hand lenses, I urged them to share their observations. When a student announced she saw cellular structure, curiosity emerged on everyone's faces.

I replied, "Those are dinosaur bones." Then, I pulled out topographic maps to show the students just where the samples came from. Students grappled by each other to get a first hand look at the fossil fragments. The questions intensified into a frenzy rivaling a swarm of the infamous Arctic mosquitoes.

The isolation I previously experienced as a teacher has finally begun to erode because a few researchers allowed me to accompany them on an expedition to the isolated expanses of Alaska's North Slope. The spark inspiring the next generation of scientists has perhaps ignited their inquisitive energy. ❑

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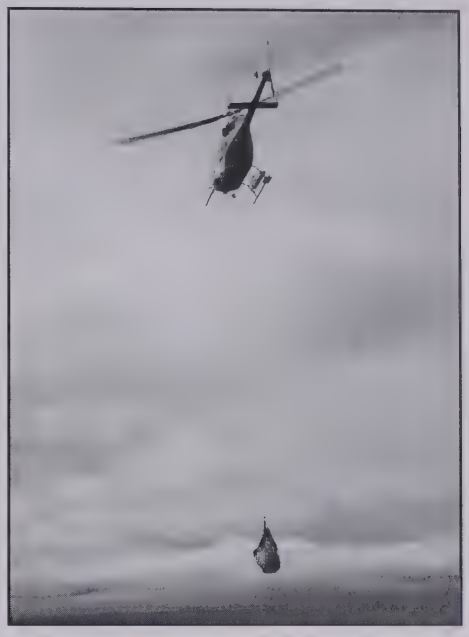

PHOTO: TONY FIORILLO

A National Science Foundation-chartered helicopter slings away the largest jacketed fossil to be taken from the Kikak-Tegoseak bone bed along the Colville River in August 2006.

ARCTIC TOURISM (CONTINUED FROM PAGE 29)

A second related trend is toward "mass tourism," the post-WWII technology-assisted popularisation of travel such that touring was no longer reserved for the wealthy. A final trend is the package tour, in which a single travel agent or broker uses transportation choices to thread together a suite of destinations for sale as a unit to the traveler. Batch size, mass tourism, and packaged tours act in concert to encourage destinations to maximize their capacity and to operate as close to capacity as possible for as long as possible. In theory, upward pressure on the volume of visitors keeps the per-destination price affordable to more visitors. Package tours relieve the consumer of most planning worries. Travelers can float along relatively passively in a current of visitors. Package tourists seem cocooned away from firsthand experiences of their destinations. Heaven forbid that such semi captive passengers break from the group to spend money on an alternative or rival activity! I don't know whether a shrewd analyst has shown this to be true, but I suspect that packaged mass tourism and increasing batch size result in distant tour brokers' stripping money more efficiently from visitors' pockets, with the result that a dwindling share of visitors' money actually stays behind to circulate in any communities through which tourists have passed.

Steve Colt (pers. comm., 2006) notes that much of the increase in Alaska visitor counts is connected to the increase in the cruise ship contribution to the visitor stream. So far, this cruise ship sector has not penetrated far north, certainly not yet to any extent into Arctic waters. But the cruise/package tour phenomenon is nevertheless credited with changing patterns of visitorship in National Parks and Preserves deep into Interior Alaska (Medred, 2006). The take-home lesson for true Arctic tourism? Monitor the trends on your southern approaches. Beleaguered Venice draws 3-5 times more visitors per year than do all the far-flung destinations combined above 60°N. Imagine coping with the people pressure if 15-18 million travelers suddenly heeded Deutsche Presse Agentur's or Yogi Berra's words, and all headed north to find less crowded destinations. ❑

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Dinosaurs of Alaska: An Update

by Anthony R. Fiorillo

By now many students of Arctic studies are likely aware of the very important discoveries of dinosaurs in Alaska. By far most of the scientific attention has focused on the remarkably rich dinosaur accumulations along the Colville River on Alaska's North Slope, but additional discoveries elsewhere on the North Slope as well as discoveries in places like Denali National Park and Aniakchak National Monument have opened the door to new research questions regarding the paleobiology of these animals.

Alaska is built of enormous geologic blocks, some of which originated far from their present location. During the Cretaceous, however, many of these blocks of land were near their current latitudinal position or yet closer to the North Pole. Thus, dinosaurs found in Alaska are not only from the high latitudes now, but they also lived in the high latitudes during the Cretaceous. These new dinosaur discoveries raise several major challenges to our interpretation of the paleobiology of dinosaurs. For example, because dinosaurs seem to have been year-round residents of the high latitudes, our understanding of the physiology and ecology of dinosaurs was problematic. In some cases there seem to have been key adaptations exhibited by these dinosaurs for living in the north.

Also, it has long been recognized that Alaska served as part of the Beringian connection between Asia and North America. It was this connection that allowed various taxonomic groups of Pleistocene flora and fauna to move between these two land masses. A developing understanding of the paleoecological context of the Cretaceous Alaskan dinosaur record strongly suggests that there is a component of deep time Beringia that remains to be fully appreciated. A Cretaceous origin of the connection between Asia and western North America obligates us to a view that the Bering land bridge concept is rooted in geologic phenomena of plate tectonics rather than in more recent climate-mediated processes such as sea level changes.

Lastly, the concentrations of dinosaur bones in the deposits preserved along the Colville River are among the richest accumulations found anywhere in the world. Is it purely coincidental then that such accumulations are concentrated in such a limited geographic area, or are these concentrations indicative of a climatic factor related to the high latititudes?

What We Think We Know

The Cretaceous dinosaurs of Alaska included large and small theropods, a pachycephalosaur, an ankylosaur, ceratopsian and hadrosaurian dinosaurs, as well as birds. In addition to these dinosaur remains, remains of chondrichthyians (sharks), osteichthyans (bony fishes), a turtle, and among mammals, multituberculates, marsupials, and placental mammals have been found. The most spectacular quarries are the Liscomb Quarry, a remarkable bonebed containing thousands of bones, largely of juvenile hadrosaurs, and the Kikak-Tegoseak Quarry, a second, equally remarkable bonebed containing the remains of several types of dinosaurs but dominated by the remains of the horned dinosaur, *Pachyrhinosaurus*. Data from fossil plants, isotopes and several other means have shown that the climate of the high latitudes was milder during the Cretaceous than it is today. The mean annual temperature range for the Cretaceous North Slope is approximately the range observed today between coastal Oregon and continental southern Alberta.

Portion of an illustration by Karen Carr, showing adult and juvenile hadrosaur,* Edmontosaurus *(left) being pursued by the large-eyed* Troodon, *(right) in the Cretaceous coastal plain setting of Northern Alaska with young Brooks Range mountains in the background. Reproduced here with permission of the artist.

Biomechanical modeling of the hadrosaurs suggests that these dinosaurs were year round residents of the high latitudes. If the prey did not migrate, then intuitively it seems logical that their predators similarly did not, and that both adapted to year-round existence in the high-latitudes. In Alaska the preserved potential prey items include hadrosaurs, ceratopsians and pachycephalosaurs, animals also preserved in Montanan and Albertan dinosaur faunas. Wear patterns on the teeth of predatory dinosaurs in Alaska mimic wear patterns observed on the teeth of similar dinosaurs in the lower latitudes. Therefore these predatory dinosaurs were eating similar food items, which we infer to be meat rather than a mix of meat and bone. The most common predatory dinosaur of Alaska is *Troodon formosus* an animal that is quite rare to the south.

Dale Russell and Ron Seguin examined the cranial capacity of *Troodon formosus* and showed the large brain size and eye orbit diameter of this animal relative to other small theropods. From this observation, they suggest that *Troodon formosus* was a crepuscular or nocturnal predator, in other words, a predator that was adapted to low levels of sunlight. It seems reasonable then that the abundance of *Troodon formosus* in the Alaskan fauna is a specialization that reflects a requirement for successful life in a high latitude environment. In addition to its greater abundance in northern Alaska another difference *Troodon* shows between the northern form and the form found to the south is body size based on teeth. Measurements of dozens of teeth from the two different geographic areas show the northern to be approximately 50 percent larger than its southern relatives.

What We Still Would Like to Know

If these dinosaurs spent the winters in an environment that had an extremely seasonal light regime, how did they survive? The climate of Alaska was much warmer than it is today, but the dinosaurs still had to contend with long, dark winter seasons. We don't think they had fur and it is unclear which dinosaurs may have had feathers, so how did they survive? Rather than apply mammalian physiological patterns to dinosaurs, a decoupling of energy flow as observed in modern reptiles could be the key. Arctic dinosaurs may have effectively restricted their metabolic rates during the winter and reproduced during the summer. Paleontologists tend to think that dinosaurs were endotherms, but perhaps they were instead reptiles–the large-bodied extreme of an ectothermic life history phenomenon. Additionally, rather than a near complete metabolic shutdown for these large herbivores, during these periods of dark, when deciduous plants presumably lost their leaves, delignified wood may have served as a low-grade food source for the plant eaters.

Also, why are the bone concentrations of dinosaur remains so remarkable along the Colville River? These Arctic bonebeds were formed under unique conditions, and regional climate may be a driving force in the preservation of fossil bone assemblages. The Brooks Range formed the southern edge of the Colville Basin in the Cretaceous. A conservative estimate for the elevation of the Brooks Range at that time is 1500 m. Further, in contrast to the mild temperatures indicated on the coastal plain, reconstructions of mean annual temperatures in the Brooks Range indicate that they were below freezing, hence capable of supporting icefields and associated permafrost. Stream dynamics in permafrost dominated-watersheds are distinguished by periods of intense seasonal runoff. This dramatic seasonality may be responsible for the extraordinary bonebeds along the Colville River. One nagging discrepancy challenging or interpretive skills is that the sediments encasing the densely packed bone accumulations suggest low-energy rather than high-energy deposition. In other words, we cannot explain how such remarkable deposits of the bones of animals that were up to 10 meters long formed in channel systems that might have been only be a few meters wide.

By now, exchange of terrestrial organisms across a land bridge between Asian and North American land masses through the Tertiary and Quaternary is a well established concept in Earth history. The region referred to as Beringia by Cenozoic workers is also the most likely route for Mesozoic dinosaur migrations between central Asia and western North America in the Cretaceous. The concept of an intermittently submerged land bridge in Beringia, as used by Eric Hultén, David Hopkins, and now many others, gained favor as evidence accumulated for sea level changes driven by external dynamics such as the atmosphere and climate during the Pleistocene. Dinosaur paleontology and plate tectonics suggest that the origin of Beringia is better assigned to the Cretaceous at a time when the defining determinant for Beringia lay in Earth's internal processes, the accretionary tectonic history of that part of the Arctic that includes western North America and eastern Asia. Given the differences in climate between the Greenhouse Earth of Cretaceous Alaska and the Icehouse Earth of Quaternary Alaska, further study of these parallels through time will provide insight into what is meant by particular ancient ecosystems and perhaps even into the origins of the Arctic.

My colleagues and I are still in the early phases of our work, which clearly seems to bear on a variety of paleobiological, paleoecological, sedimentological and paleogeographic issues. And as with any new and challenging scientific project, we are just learning how to ask the questions. ❑ ***Anthony R. Fiorillo is with the Museum of Nature and Science in Dallas, Texas***

PHOTO: TONY FIORILLO

A view northward over the Kikeak-Tegoseak Quarry, with main channel of the Colville River below. Note diggers on the hillside at left.

Remains Found of Huge Jurassic Period Reptile

***IANS*, London, 9 October 2006**— The remains of an enormous Jurassic period marine reptile, one of the largest pliosaurs ever, was discovered near the North Pole.

The skeleton of the bus-sized reptile, nicknamed "The Monster", had a length of 33 feet or more. It was found along with a treasure trove of other unusual dinosaur-era fossils by Norwegian scientists, reported the online editor of Discovery News.

Pliosaurs were marine giants that had short necks, massive heads and numerous banana-sized teeth, it said.

Jørn H. Hurum, assistant professor of vertebrate paleontology at the University of Oslo, Norway, and his colleagues found all the remains at the arctic archipelago of Svalbard, which appears to have been teeming with life 150 million years ago.

The scientists announced their finding as a preliminary report and plan to continue excavation and preparation before publishing on the discovery.

In just two weeks, the researchers found evidence for 27 marine reptiles, and they suspect there's more where those came from. ❑

Coast Guard Divers' Deaths Explained

***Seattle PI Online* (AP), 22 November 2006, by Gene Johnson**—One of two Coast Guard divers who mysteriously perished during a training dive in the Arctic last summer plunged toward the ocean floor in an uncontrolled descent, suffocated and developed lung trauma during a rapid rise to the surface, according to an autopsy report summary Tuesday.

And by the time the two divers from the icebreaker *Healy* had been pulled up, "one diver's (air) tank was completely empty and the other diver's tank contained 90 psi (pounds per square inch)"—the latter typically not sufficient to deliver air through the breathing regulator, the report said.

The report was provided to The Associated Press by William Hill Jr. of St. Augustine, Fla., the father of Coast Guard Lt. Jessica Hill, who died along with Boatswain's Mate Steven Duque on Aug. 17, 500 miles north of Alaska.

The Coast Guard has released little information about the deaths but relieved the *Healy*'s commander, citing a loss of confidence in his ability.

A spokesman said the Coast Guard would not discuss the autopsy report pending the outcome of its investigations, which is expected next year.

Hill, 31, and Duque, 22, had slipped into a patch of open water near the ship's bow and were planning to dive to a maximum depth of 20 feet, William Hill said. A support team held ropes attached to them lest they become disoriented under the ice.

The autopsy report summary, written by Armed Forces Regional Medical Examiner Stanley D. Adams, said Hill suffered "an uncontrolled descent to a possible depth of 189 feet." Her father said that if in fact she went that deep, he didn't understand how the dive support team could have failed to prevent it.

"Why in the hell did they let out that much rope?" he asked.

Furthermore, he said, the amount of air in the divers' tanks would have lasted a half-hour at 20 feet, but only 10 minutes at 180.

The dive support team reportedly pulled the divers to the surface after becoming concerned; attempts to resuscitate the two failed.

The autopsy ruled Hill's death an accident. The cause was asphyxia (a lack of oxygen or buildup of carbon dioxide in the body) with pulmonary barotrauma (an expansion of air in the lungs as pressure decreases during ascents) and possible air embolism (air bubbles in the blood).

Duque's family could not immediately be reached to confirm whether he died of the same causes.

The autopsy summary also noted that a third diver planned to take part, but "immediately aborted the dive" for reasons that are not mentioned.

The *Healy* was sailing through the Arctic with about 35 scientists to collect data that would help them map the ocean floor. Hill was the ship's dive officer, as well as the liaison between the scientists and the crew.

Shortly after the tragedy, the *Healy*'s commander, Capt. Douglas Russell, was relieved of duty and reassigned to administrative tasks; his superiors cited "a loss of confidence in Russell's continued ability to command."

Capt. Tedric Lindstrom is the new commanding officer.

Hill said he plans to ask an independent pathologist to review the autopsy results. ❑

Book Reviews

Arctic Wings: Birds of the Arctic National Wildlife Refuge

Edited by Stephen Brown Ph.D.
Mountaineers Books , Seattle, Washington

Review by Cliff Bekkedahl

Bird lovers and Arctic buffs: Clear your coffee tables—make way for one of the most stunning collections of photographs of the winged life that lives or visits the northern reaches of Alaska on the Beaufort sea. The Refuge comprises 19.5 million acres of wild and undeveloped land. Yes, it also neighbors Prudhoe Bay and contains other potential oil and gas drilling sites that we hear so much about in the political arena. Some twelve essayists who are contributors to this large and weighty volume clearly express their concern and warnings as to the dire consequences of energy development that are certain to occur to this fragile ecosystem that sustains and nurtures birds from all over the world. This is U.S. Territory that is the summer home for countless migratory species of birds and year around residency for a handful of tough guys who can forage and endure in the darkness and frigid temperatures of the Arctic winter.

The book means to persuade and presents compelling arguments for restricting development in the Refuge. If you are a believer, then the reading is comforting and arms you for advancing the arguments with the uninformed. If a skeptic, then *Arctic Wings* will challenge and persuade and more often change minds. All of this, of course, is back drop to the most extraordinary collection of photographs of birds in their Arctic habitat that can be found anywhere. It features the work of six world-renowned wildlife photographers who have spent decades in the northernmost region of the country patiently stalking their subjects for that exquisite moment of light, color and action.

The copy presented to *The Polar Times* for review is soft bound and includes a CD of Arctic bird songs. To inquire of purchase or if there is a hard-cover edition, contact mbooks@mountaineersbooks.org. ❑

The North Pole Was Here: Puzzles and Perils at the Top of the World

by Andrew C. Revkin

Review by Tim Tibbitts
Brown Alumni Magazine Online

After eleven years of reporting on global environmental issues for the *New York Times*, Andrew Revkin is taking his message to kids. The author of the 1992 *Global Warming: Understanding the Forecast,* Revkin aims his new book, *The North Pole Was Here*, at preteens. It's the first in a planned series of books by *Times* reporters aimed at children.

Refreshingly, Revkin avoids sounding polemical or overly catastrophic; this is no "We've wrecked the planet, and if we don't change our evil ways right now, we're doomed" tract. Like a good science teacher, he re-creates for young readers the drama of scientific exploration and discovery. He frames his book as an adventure tale, basing it on a three-day trip he took to the North Pole in April 2003 to report on scientists who since 2001 have been studying temperatures and salinity in the Arctic Ocean and the thinning ice sheets that drift across it.

Into their story, Revkin weaves a primer on global warming and the contribution of humans to its rise. He also intersperses chapters on the role of the North Pole in the human imagination, from legends of an unreachable land to the Age of Discovery to the systematic study of more recent times. Each chapter ends with an article or two reprinted (and modified slightly for a younger audience) from the *Times*.

Revkin brings to his first book for young people the same crisp, clear writing readers have come to expect from his more than 1,000 newspaper articles on global environmental issues. He also adds the kind of personal touch that is absent from most daily news-

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Rediscovering World's 1st Arctic Sub: NAUTILUS of 1931

by Stewart B. Nelson, Ph.D.

In September 2005, the two-person submersible *JAGO* was used to re-discover and document the largely forgotten Arctic submarine *Nautilus*, scuttled in the fjord at Bergen, Norway, in 1931.

Many considered the Wilkins-Ellsworth Trans-Arctic Submarine Expedition of 1931 a foolhardy undertaking. Others thought it nothing more than a publicity stunt. However, for the Australian-born adventurer Sir Hubert Wilkins it was the opportunity to be the first to use a submarine to cross the Arctic Ocean by way of the North Pole. He had already gained fame for his aerial exploits, including, in 1928, the first airplane flight across the Arctic Ocean from Point Barrow, Alaska, to Spitzbergen, Norway, a feat the earned him a knighthood.

Partnering with Simon Lake, the pioneer submarine designer, and Sloan Danenhower, a former submarine officer, Sir Hubert acquired the vintage World War I submarine O-12. Completed in 1918 and decommissioned in 1924, the O-12 was awaiting scrapping in Philadelphia Navy Yard. With the understanding that it be used only for scientific purposes, it was leased "as is" for five years at one dollar a year. Financial support came from many sources, most notably the American millionaire Lincoln Ellsworth. Extensive modifications were made to the O-12 to prepare it for under-ice operations. These included such special features as a 12-foot-long cushioned bowsprit, a telescoping man-sized hollow drill capable of boring through 15-feet of ice, special hollow air intake and exhaust drills to enable recharging the batteries while submerged, a diver lock-out chamber and a scientific laboratory.

At a ceremony in March 1931, the O-12 was renamed *Nautilus* in honor of Jules Verne's fictional submarine in *Twenty Thousand Leagues Under the Sea*.

After further modifications and tests, the *Nautilus* began its Atlantic crossing on June 4, already running behind schedule for a planned July rendezvous at the North Pole with the German airship *Graf Zeppelin*. Midway across, both engines failed and, with the *Nautilus* wallowing helpless in storm-tossed seas, an SOS was broadcast. The battleship *Wyoming* came to the rescue and towed the disabled *Nautilus* to Queenstown, Ireland. After emergency repairs, the submarine limped into Devonport, England, for month-long repairs. Finally, on August 1, *Nautilus* reached Bergen, Norway, where the six-member scientific party had been waiting. With 20 persons now on board, the submarine headed north to Tromso for refueling before heading to Spitzbergen. The weather window for meeting with the *Graf Zeppelin* was gone but Sir Hubert was determined to at least get to the North Pole, if not across the Arctic Ocean. The *Nautilus* arrived at the pack ice on August 14, and several days were spent making scientific observations on the surface. On August 22 it was decided to make a test dive under the ice, but problems arose. A diver was sent down at the stern and reported that the diving planes were gone! How they fell off is a matter of conjecture, but both Sir Hubert and Sloan Danenhower suspected sabotage. The scientists busied themselves with various projects, and some pseudo dives were made by powering the submarine under the ice edges. On September 6 the battered and leaking *Nautilus* left the pack ice and sailed into Bergen on September 20. The lease called for the submarine to be returned to the United States, but vessel's condition made that impossible. Permission was finally given to sink the submarine. On November 30, 1931, the *Nautilus* was towed three miles offshore and scuttled in 1,138 feet of water.

My interest in the *Nautilus* began several years ago, but not until late 2004 did I learn from contacts in the Bergen Maritime Museum that the submersible *JAGO* was going to be used for a project off Spitzbergen in summer 2005 and then off-loaded in Tromso for return to Germany. This was the chance that I had wanted. Communication was quickly established with Dr. Hans Fricke of the Max Planck Institute, and plans were made to set aside a week following the completion of the Spitzbergen expedition to bring the *JAGO* to Bergen from Tromso. What was now labeled "Project Nautilus 2005" began to take shape, and efforts were initiated by both Hans Fricke and myself to acquire corporate sponsors. Special thanks must be given to Holland America Line, Thyssen Foundation and the American Philosophical Society. Project Nautilus was also awarded a flag from the prestigious Explorers Club.

Good fortune came our way when we learned that the Royal Norwegian Navy (RNoN) was planning to conduct a mission demonstration outside Bergen using a HUGIN 1000 AUV. We asked if it were possible to extend the operation area to include supposed location of the *Nautilus*. This the RNoN graciously did and impressive sonar imagery was obtained.

Many considered the Wilkins-Ellsworth Trans-Arctic Submarine Expedition of 1931 a foolhardy undertaking.

On the evening of Sunday, September 11, the Project Nautilus principals gathered at the Bergen wharf facility awaiting the truck bearing the submersible *JAGO*. Besides myself, the *JAGO* team from Germany consisted of Dr. Hans Fricke, project co-leader; Juergen Schauer, submersible pilot; Karen Hissmann, operations manager; and Sebastian Fricke, operations assistant. Also present was Arild Hansen of the Bergen Maritime Museum and two other Bergen residents critical to the project: Halvor Mohr, master of the support vessel *Navigator*, and his able colleague Atle Toskedal.

During the week of September 11, a total of four productive dives were made on the historic *Nautilus*. Approximately 1,800 digital images and eight hours of video were acquired during these dives. All in all, the submarine is in reasonably good shape. We were anxious to examine the stern to see the area of the missing rudders. Unfortunately, the stern is buried in the seabed. Among the distinctive features visible was the bowsprit, the huge hollow drill, the air intake hollow drill, and the divers air lock.

So what now for the *Nautilus*? The Bergen Maritime Museum will expand its exhibit with the imagery we collected and attempt to have the submarine designated as a historic underwater site. There are no plans to raise this world's first Arctic submarine. ❑

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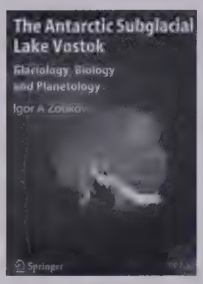
paper journalism, describing, for example, his own excitement and fears about walking on a constantly shifting layer of ice only six to nine feet thick over a frigid ocean 14,000 feet deep.

Revkin describes the science behind the role of greenhouse gases in global warming in the gentlest of ways, trusting his readers to draw their own conclusions about what should be done. He believes the "only approach to the climate issue that will galvanize significant action is for grown-ups and their kids and grandkids to explore it ensemble." His book is an excellent starting point for that discussion. ❑

MORE BOOK REVIEWS ON NEXT PAGE

Book Reviews (contd)



Subglacial Lake Vostok: Glaciology, Biology and Planetology

by Igor A. Zotikov
(Springer Praxis Publishing, 2006, 139 pp, $129)

Review by John Splettstoesser

Subglacial Lake Vostok: Glaciology, Biology and Planetology is very timely, as the subject has been in the news for some years because of its importance to a variety of scientific disciplines. The author was involved in several aspects of its history of discovery, scientific drilling, and interpretation of results obtained from radio-echo sounding to present-day proposals to penetrate the lake itself for sampling of the water and its bottom sediments.

With a cover of some 4,000m of ice overlying it and occupying a depression in the bedrock beneath Russia's Vostok station, Lake Vostok is about 250 by 50 km (about the size of Lake Ontario), and perhaps 1,000m deep as determined by seismic studies. It may well be, as the author indicates, that the discovery of Lake Vostok is among the most important geographical discoveries of the second half of the previous century.

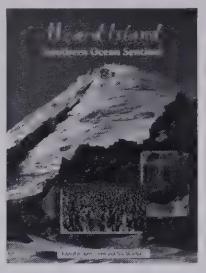
The bottom of the lake is at the pressure melting point, warmed by geothermal heat. Because this area of the East Antarctic ice sheet has been relatively stable for probably hundreds of thousands of years or more, it is possible that evidence of micro-organisms (bacteria) might exist there.

A number of technical problems occurred in attaining a depth of more than 3,600m when drilling ceased at about 130m above the surface of the lake. Samples at that depth showed the ice to be accreted from frozen lake water. Penetration halted as a precaution until proper technical issues could be satisfied so that the lake would not be contaminated when penetration of a sampling device occurred.

The proposed device is described in detail by the author, although critics have stated that the technique is not foolproof, and it is best to wait for consensus among the international community as to when and how the final meters should be penetrated and the lake water sampled.

Drilling has continued so that less than 100 meters remains of the ice before lake water is entered. Concerns still exist in some respects because it is known that numerous other lakes exist beneath the ice sheet of Antarctica, located near ice divides, and it is possible that some are interconnected by sub-ice plumbing. With that in mind, any contamination of Lake Vostok could affect others.

The bottom line for this exercise is not in this book, but the next few years will no doubt have some answers to critical questions, as well as how the lake was sampled successfully. Applications of the Lake Vostok study to planetary studies include plans to penetrate the ice cover of Europa (a moon of Jupiter) for subglacial water, as well as subglacial lakes beneath Martian ice. Another Igor Zotikov book will undoubtedly enter the scene in years to come to explain how this can be done, or was done, and appropriate credit will be given to this forward-thinking Russian glaciologist. ❑



Heard Island: Southern Ocean Sentinel

Edited by Ken Green and Eric Woehler.
New South Wales: Surrey Beatty & Sons, 2006.
ISBN 0-949324-98-1, 280 pp. Paperback, A4, Aud$77.00

Review by Charles Lagerbom

It is not every day that a polar book thoroughly and competently covers a wide-ranging field of topics about its particular subject. But a new book about Heard Island has done just that. *Heard Island: Southern Ocean Sentinel*, published by Surrey Beatty & Sons in Australia, is an excellent book that covers many aspects about this remote volcanic island. The book's editors, Ken Green and Eric Woehler, both have extensive history and personal connections with the island and the book's multi-faceted approach reflects this.

There are many reasons to like this book, from the colorful cover with its striking image of the smoking volcanic cone of Mawson's Peak to the detailed fold-out map on the first page, to the itemized flora/fauna appendices and lengthy index. The true strength of the book, its overall comprehensiveness, is evident through the fifteen different review chapters of its 280 pages, all authored by an extensive and diverse group of contributors, experts in their particular fields. Though the different chapters are written by a variety of authors, all present their information in an understandable and enjoyable format for any polar enthusiast. Whether one is interested in the island's human occupation, its geology, glaciers, climate, flora or fauna, there is a well-written and authoritative section that covers it. Filled with many informative graphs, charts and photographic images (both color and black/white), each chapter also includes a helpful introduction and its own references section. The chapters on sealing and the island's ANARE years were particularly interesting.

Heard Island: Southern Ocean Sentinel should be the model or template for such complete studies of any island, region or area, whether polar related or not. It will make a great addition to any polar library. The book is available through Surrey Beatty & Sons Pty Ltd. They can be reached at surreybeatty@iform.com.au ❑

Below Freezing: The Antarctic Dive Guide

by Lisa Eareckson Trotte
(WildGuides Ltd., 2006, 116 pp, $37)

Review by Jeff Rubin

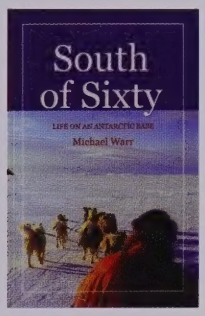
Below Freezing: The Antarctic Dive Guide is the first and only dive guide to the Antarctic, full of practical information about submersing oneself in the "weird and wonderful" -1.8°C underwater world of the Southern Ocean as well as details about 25 dive sites on the Antarctic Peninsula and at South Georgia. With Antarctic diving becoming more popular each year, this very useful book will become a must-pack for under-ice visitors. The dozens of terrific color photographs of marine life also make it fascinating for non-divers.

The author learned to dive in Antarctica—perhaps the only person yet to do so, and she has gone on to do "over 300 hours of Antarctic underwater exploration" in her work as an assistant expedition leader, undersea specialist and dive master aboard Lindblad Expeditions' tourist vessel *Endeavour*.

Below Freezing includes a nine-page section on underwater photography by David Cothran, an expedition leader and undersea specialist for Lindblad Expeditions, with several beautiful examples of his work, testament to his authority on the subject. There's also a 3-page history of Antarctic diving (for a more detailed history, referenced in this book's bibliography,

see Peter Brueggeman's "Diving Under Antarctic Ice: A History," February 1, 2003, Scripps Institution of Oceanography Technical Report, at http://repositories.cdlib.org/sio/techreport/22).

A sobering 6-page "Special Note About Leopard Seals" was written by Shona Muir, who undertook a 12-month research project about interactions between divers and leopard seals, supported by the British Antarctic Survey, after a snorkeling marine biologist was killed by a leopard seal in 2003 (see "Due South" in this issue). Not much is yet known about leopard-diver interactions; the guidebook can only caution that the seals "can display predatory behaviour toward humans." To purchase the book, visit www.wildguides.co.uk ❑



South of Sixty: Life on an Antarctic Base

by Michael Warr (Antarctic Memories Publishing, 2005, 164 pp, $21.95)

Review by Jeff Rubin

South of Sixty: Life on an Antarctic Base is the lively story of two years spent as an FID—or member of the Falkland Islands Dependencies Survey, the precursor to the British Antarctic Survey—at British bases B and T (Deception Island and Adelaide Island, respectively) beginning in 1963, interestingly contrasted with his tourist journey to the same area in 2005.

Warr went south as a twenty-year-old, and freely admits that he did a lot of growing up on the Ice. Much of the time at Deception was devoted to socializing with the Argentines and Chileans living at neighboring bases, though the FIDs outvisited their neighbors by a factor of three ("Were we too familiar?" he asks). One FID made a three-week visit to Chile's nearby Pedro Aguirre Cerda station, while another spent a long time recuperating at Argentina's Decepción station (a nine-mile walk around Port Foster and over a glacier from Base B) after he damaged his knee while sliding down an icy patch of snow. The omission of this member's extended stay from the base's monthly reports to HQ, Warr says, may have been "an acknowlegement that some British bases did not have adequate medical coverage."

Drinking was a big part of life at Base B, and the subject gets its own chapter in Warr's book. The house drink was "moose milk"—tinned condensed milk and 160 proof navy rum—served in a "Fid's tot" equal to three standard tots. Snipping the ends off visitors' neckties was another base tradition; the collection tacked up on the walls of the station's bar included one snippet from the Duke of Edinburgh.

Warr was in charge of the Jesters, Base B's husky team, and some of his most interesting writing concerns the dogs. The winter of 1964 was a hard one, and Deception's harbor, Port Foster, froze all the way across. Warr took a team across the sea ice to the Argentine base, and even out to Neptunes Bellows, where there was open water. On another occasion, he had to put down an arthritic dog named Saki. Tears filled his eyes as he walked back from Neptune's Window, having dispatched the whimpering animal with a .45 after first just grazing it, and then pushed the corpse over the cliff edge,.

Warr's second year was spent much further south at Adelaide Island ("South of Sixty"), which he found "less gloomy" than "damp and dark" Deception, and with more snow, "everything looked white and clean." Adelaide, unfortunately, was a "static base," at which FIDs did no sledging trips, geologizing or surveying in the field. That meant base members' time, outside of their indoor work, was their own. Warr took the Huns, Base T's huskies, on several sledge trips.

In an interesting aside about early Antarctic tourism, Warr notes that "an unusual rumour" reached Adelaide Island in 1964: a New York tourist company would be visiting the Antarctic for the first time, charging clients the "outrageous" sum of $3,000 each. Though base members were skeptical of the report, they nevertheless "got busy making souvenirs of genuine seal leather belts, wooden mugs, etc." Unfortunately, no tourists turned up.

But in February 2005—39 years after he left the Antarctic—Warr himself took an Antarctic tourist cruise aboard *Polar Star*; half of his fellow passengers had worked at British Antarctic bases between 1948 and the 1980s. Wined and dined at Rothera, the ex-FIDs compared notes with the station's staff:

> "We made an effort to make sense of their regulated and regimented life. The UK headquarters had a lot more input into this base than it did to our more isolated bases of the past. The outside world could not be ignored as daily e-mails poured in. Some Rothera personnel deliberately did not communicate home in order to have some semblance of an isolated Antarctic experience… the personnel, especially in summer, seemed to observe the Antarctic as if from afar rather than being part of it."

The "real Antarctica," the former FIDs felt, "had disappeared." Other things had changed, too. Women arrived, huskies departed.

One happy result of all the changes, however, is that "the death rate in the last 30 years has been about one-third what ours was," Warr writes: approximately "two deaths every three years," from 1944-1965.

In all, it was a rather melancholy pilgrimage, with stops at Stonington Island, Adelaide Island (where high seas prevented a landing), and the Argentine Islands base, now Ukraine's Vernadsky station (where ice prevented a landing). Of Port Lockroy, the former British base now turned museum/post office/souvenir stand, Warr writes: "there had to be one Antarctic tourist trap."

At Deception, where a 1969 volcanic eruption and ensuing mudslide badly damaged Base B, Warr found that the ruins "did not have anything left that I could hold on to…sometimes one cannot go home again."

Finally, a note about photography, which Warr says was the main diversion for most base personnel, second only to their jobs: "Photographs captured the Antarctic; it was proof that we had been to a unique place." Thus it is disappointing that the choice of color photographs reproduced in the book (there are 16) is not as interesting as it could be. There are ordinary shots of penguins, a fur seal, a husky…in short, photos that can be seen in nearly every book about the Antarctic ever published.

What we would like to see are the photos that Warr describes taking: "the brave FID fighting his way up the 'high street' in a blizzard"; a husky hanging from a tripod to be weighed; the author himself "nicely lubricated," eyes closed and head thrown back, singing a mournful Negro spiritual; or even the midwinter celebration dinner menus or the British Antarctic Survey Driving Licenses they carefully made up. These are images unique to the narrative, not generic Antarctic pix, and this book would have been improved by their inclusion. ❑

Wondrous Cold: An Antarctic Journey

by Joan Myers (Smithsonian Institution Traveling Exhibition Service - SITES, 2006, 160 pp, $35)

Review by Jeff Rubin

Wondrous Cold: An Antarctic Journey is the result of photographer Myers' four-month visit to McMurdo Station in 2002-2003 through NSF's Antarctic Artists and Writers Program, along with trips to the Antarctic Peninsula with three different tour operators. It accompanies a Smithsonian traveling exhibition of 50 color and black-and-white images that premiered at the Smithsonian's National Museum of Natural History in May 2006; the exhibition will also travel to Miami; Jackson, WY; Oneonta, NY; St. Petersburg, FL; Port Arthur, TX; Ontario, CA; Salina, KS; Springfield, MA; Spartanburg, SC and other cities. ❑

OBITUARIES

Masayoshi Murayama

***Kyodo News*, 7 November 2006**—Masayoshi Murayama, a member of the first Japanese expedition to reach the South Pole in 1968, died of prostate cancer Sunday at a hospital in Tokyo, his family said. He was 88. Murayama participated in the first Japanese attempt to reach the South Pole in 1956. He joined expeditions seven times in all, serving three times as winter expedition team leader. He and 11 other members of an expedition finally reached the South Pole in 1968, the first Japanese team to do so. Murayama also headed a team that in 1959 rescued two dogs, Taro and Jiro, from the Showa Base that the first team was forced to abandon. The story of the dogs' rescue became the basis of the hit film "Nankyoku Monogatari" ("Antarctica") in 1983. ❑

Robert E. Feeney

United Press International, **29 September 2006**—Robert E. Feeney, a biochemist and Antarctic explorer who discovered a protein that allows fish to survive in icy waters, died Sept. 21 at his home in Davis, Calif. He was 93. A retired scientist and researcher at UC-Davis, he was known as "professor on ice," the title of his 1974 book, for six expeditions he took to Antarctica during the 1960s. He also wrote Polar Journeys: The Role of Food and Nutrition in Early Exploration (1997). While researching penguin eggs, he discovered peptides that prevent ice formation in fish blood, part of his pioneering work in low-temperature organisms. ❑

John Campbell Craddock

John Campbell Craddock passed away on 23 July 2006 at the age of 76 years. He earned a B.A. degree at DePauw University (where he was a Rector scholar, president of Sigma Chi fraternity and Phi Beta Kappa; 1951) and his M.A. (1953) and Ph. D. (1954) at Columbia University (where he held Higgins and NSF fellowships). He worked 2+ years for Shell Oil Co. in New Mexico, Texas, Colorado and Wyoming. In 1956 he joined the faculty of the University of Minnesota-Minneapolis, and in 1967 was appointed Professor of Geology at the University of Wisconsin-Madison where he served as Department Chair from 1977-80 before retiring in 1996. In 1959 he made the first of 10 trips to Antarctica, eight for field research, one as leader of an ocean drilling (DSDP) project, and lastly as a tourist with his Dottie in 2005. He also led research efforts in the Alaska Range, Spitsbergen, Wyoming and the Huron Mountains of Michigan's Upper Peninsula, supervising 90 graduate theses. Cam enjoyed a visiting Professor appointment at Nanjing University in China in 1981. He was active in the Geological Society of America (GSA; Section Chair, National Structural Geology Chair, and Books Editor [1982-88]), the Scientific Committee on Antarctic Research (SCAR), the U.S. Polar Research Board, the Circum-Pacific Map Project, the International Union of Geological Sciences, including the Commission on the Geologic Map of the World (1974-91). Cam organized the 1977 Gondwana meeting hosted in Madison, and was editor of the Antarctic Geoscience volume published in 1982. His honors include the U.S. Antarctic service medal, the Bellinghausen-Lazarev Medal of the Soviet Academy of Sciences, the GSA Distinguished Service award, and an alumni citation from DePauw University. The 15,000+ ft. Mt. Craddock in the Ellsworth Mountains, the 4th highest peak in Antarctica, was named in his honor by the U.S. government.

Cmdr. Edward Ward

Commander Edward Ward, USN (ret.), of Ocean City, Md., died 22 August 2006. In 1940, he transferred to the U.S. Navy as a Naval Aviation Cadet. After graduating from Flight School in Pensacola, Fla., in June 1941, he was designated Naval Aviator No. 7740 and commissioned an Ensign in the Naval Reserve. He served in both the Atlantic and Pacific Fleets during World War II, flying PBY seaplanes and PB4Y four-engine patrol bombers. In 1945, he transferred to the Regular Navy. He retired from active duty in July 1970 after 30 years active duty.

Commander Ward specialized in Arctic and Antarctic exploration, having participated in four Arctic Operations, 1946-52 and "Deepfreeze" 1 & 2, 1955-1956, in the Antarctic. His first experience in the Arctic came in 1946 when he conducted an aerial magnetometer survey of Naval Petroleum Reserve No. 4 in Alaska. This took in an area from Brooks Range north to the Atlantic Ocean, west to the Bearing Sea and east to the Canadian Border. The survey succeeded in finding areas of potential oil reserves, among these was Prudhoe Bay, the largest oil field in Alaska. His last Arctic expedition was "Project Ski-Jump." Flying a ski equipped R4D (DC-3), he established eighteen oceanographic stations between Barrow and the North Pole. This gained him the distinction of being the first U.S. military pilot to make successful landing on the unprepared surface of the polar ice cap. He commanded Air Utility Squadron Four, 1957 1958. In 1959, he had command of the Naval Air Technical Training Unit in Lakehurst. He served as Executive Officer and later Commanding Officer aboard the USS Albemarle AV 5, 1959-60. In 1960-62, he was Executive Officer and later Commanding Officer of the Naval Air Station in Minneapolis, Minn. Prior to his retirement, he served as Executive and Commanding Officer of the Naval Air Technical Services Facility in Philadelphia, Pa. ❑

Ray Adie

Ray Adie died recently at age 81. Born in Pietermaritzburg, South Africa, he was educated at Maritzburg College, and the universities of Natal and Cambridge and, as a pioneering earth scientist, dedicated almost all his working life to Antarctica or Antarctic affairs. In recognition of his contribution to Antarctic scientific exploration, the Adie Inlet, on the east coast of Graham Land, is named after him.

Adie's interest in Antarctica was initially sparked by the book Edward Wilson of the Antarctic by George Seaver. Later, as a student, he was further encouraged by the South African geologist Alex du Toit, who said, "Why don't some of you go and work in an interesting place like Antarctica?" So, in 1946, at the age of 21, he became the first South African scientist to set foot on Antarctica, where he was appointed geologist of the Falkland Islands Dependencies Survey (Fids).

On that occasion, he spent three and a half years in its frozen wastes. Together with his good friend, the polar explorer and scientist Sir Vivian Fuchs, Adie made two journeys of some 2,400km across the George VI Sound on a dog sledge (he became a world authority on huskies), doing extensive pioneering field research. He was to visit Antarctica a further 22 times.

In 1956, he became senior geologist to Fids, which became the British Antarctic Survey (BAS), to take charge of all geological and laboratory work at the University of Birmingham. When BAS moved to Cambridge, he became the head of its earth sciences division from 1967 to 1973 and then its deputy director from 1973 to 1985. He edited the Journal of Glaciology for over 35 years. As a result of his field work he made substantial contributions to the geological literature of Antarctica. In later years, he enjoyed the satisfaction of knowing that much of his pioneer mapping was confirmed by satellite imagery.

On the basis of his field knowledge of the stratigraphy of KwaZulu-Natal, gained in doing his masters degree (1946) at the University of Natal, together with his experience of the Falkland Islands, Adie recognised the striking similarities in the geological history of these two widely separated land masses. He proposed a new reconstruction of Gondwana showing that the original position of the Falklands was off the south-east coast of KwaZulu-Natal. His 1952 paper was supported by later research. That same year, he presented two papers on the Gondwana sequences of the Falkland Islands and Antarctica at the International Geological Congress in Algiers.

Further contributions to the earth sciences continued to focus on Antarctica geology, evidence for stratigraphic correlations to other continental landmasses during Gondwana times, and the first geochemical study of the rocks of Graham Land. Adie's international renown was recognized with numerous awards, among them the U.S. Antarctic Service medal and the Bellinghausen medal awarded by the USSR Academy of Sciences . In Britain, he was awarded an OBE, the Polar medal and the Fuchs medal. The citation for the last, written by Fuchs himself, stated, "No one could have done more in the cause of Antarctic science." ❑

A Message to Members:

Alan H. Shapley

I am saddened to report the passing of my father, Alan H. Shapley on October 20, 2006, at the Hospice Care Center in Louisville, Colo. He was 87 and had been in declining health for the past six months or so. His passing was very rapid but I was able to make it to Boulder in time to sit with him. From the e-mails from all of you about the symposia, and constitution et al., it was obvious that being able to communicate and participate in some small way in furthering polar studies and scientists passion gave him great pleasure.—**Carol L. Etter** ❑

Arctic Editor Needed

Someone with an active interest in all that goes on north of the Arctic Circle. Dr. Dave Norton has resigned as Arctic Editor of *The Polar Times* [see page 22] and we are conducting a search for his replacement.Clearly a member volunteer would be the "right" person inasmuch as they would be familiar with *The Polar Times* and the quality and quanity of material in each issue. Writing, editing and/or publishing experience would be helpful as would an Alaskan address. The latter not essential nor for that matter the former. Most important, an inquisitive mind and a desire to make *The Polar Times* the best it can be. If you are not interested but know someone who would be a viable candidate or ,if you are interested in learning more about the opportunity send me an email....cv1957@optonline.net or call at 631-267-7646

Cliff Bekkedahl

Managing Editor, *The Polar Times*

Membership Letter

Greetings from the coast of Maine! The days are growing shorter and the temperatures are dropping so it must be fall in New England. And with the fall, I managed to send out almost 600 membership renewal notices. Thank you to all who have already responded, especially for the many of you who opted for the 4 year $50 extended membership rate. This definitely helps the society on postage savings. Along with renewal notices that have been pouring into the center's mailbag, I have been asked an interesting question by some members: What exactly do I get for this membership? My first reaction was to cite the list of what you get: ie, the two issues of The Polar Times with up to the moment polar news, latest book reviews, news about members, obituaries and so on. But then I thought that that should already be obvious to anyone who looks through the publication. My second impulse was to write about the 'connection' this society fosters with others interested in the polar regions. In an introductory letter to new members, I write that the strength of this society is in its membership. Having just crunched the membership numbers for my year-end report, I can attest to the variety, breadth and depth of our APS membership. For instance, we currently have 150 lifetime members and we average about 5-10 new lifetime members per year. We also average 60+ new regular members, many through referrals or gifts from existing members. We are represented in 22 different countries on all seven continents and all 4 hemispheres with particularly large APS member contingents in Canada, Japan and the UK. APS members literally span the globe, as well as reside in 49 of the 50 states here at home (still hoping for a South Dakota membership to come along!). California is our largest member state with 133 members followed by New York and Virginia with 51 members. This definitely attests to some sort of universal connection we share. The personal stories of our members are even more interesting. We have members from the Ronne Antarctic Expedition, others who took part in Operations Highjump, Windmill, the many Deep Freezes as well as Arctic expeditions. An APS member from Japan has been onboard for 72 years. That's right, he started his membership in 1934, the very FIRST year of our society's existence! We also include scientists, naturalists, military and former military, writers, historians, cruise ship passengers, armchair adventurers, retirees, polar marathoners and many other people too diverse to define but all bound by an interest in the polar regions. Our ages range from young school students to IGY veterans, to octegenarians and beyond. We have members who have visited, worked or researched in different parts of the Arctic or Antarctic as well as members who have yet to make any sort of visitation. So what do we all have in common? We share an abidding appreciation of these very special areas of our planet. This connection defines us as a society and, I hope, that in addition to The Polar Times, might be worth the cost of membership.

Charles H. Lagerbom

Membership Chair, APS

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"The purpose of the American Polar Society is to bring together people interested in research and exploration in the Arctic and Antarctic; to preserve the record of polar research and exploration; and to support and encourage research and exploration in polar and polar-like regions. Toward these ends, the Society will collect and disseminate information about polar regions; compile written records, oral histories, maps, photographs, film and video, and electronic information relating to polar regions; aid organizers and members of polar expeditions; and maintain contact with scientists, explorers, research institutions and interested parties." ❑

About Our Back Cover

USS Arneb (AKA-56), flagship for CTF-43 for Operation Deepfreeze I, moored to ice at Kainan Bay, Antarctica. (Official US Navy Photo)

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Members In Remembrance*

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U.S.S. ARNEB (AKA-56)
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